

A Work Project, presented as part of the requirements for the Award of a Master's degree in
Finance from the Nova School of Business and Economics.

OSRAM TAKEOVER BATTLE

EVALUATING THE PRICE OF DIVERSIFICATION IN THE AMS BID

RUI PEDRO GOUVEIA PIRES

Work project carried out under the supervision of:

Rui Silva

Euclides Major

20/12/2023

Abstract

Departing from October 5th, right after AMS's second tender offer failed, this case examines the strategic acquisition of OSRAM by AMS, following a competitive bidding war involving Bain Capital, The Carlyle Group, and Advent Capital. Its primary purpose is to understand the reasoning behind AMS's bid and to assess whether a subsequent bid would be advisable, by conducting a detailed analysis of the financial implications, market response, and strategic decisions that derive from the transaction.

Keywords

Mergers & Acquisitions, Corporate Finance, Capital Structure, Strategy, Diversification, Private Equity, Share Price, Synergies, Public Information, Volatility, Stock Market, Financing, Bidding War, Innovation, Semiconductors, Lightning, Technology, Corporate Valuation

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

Table of Contents

GROUP PART	4
1. Setting the Stage: AMS' ambition	4
2. Illuminating the Industry: A Historical Perspective on Lighting and Semiconductors	6
3. AMS: Navigating the Semiconductor Terrain	8
4. Leap Forward: Everke's Era of Innovation and Growth	10
5. OSRAM: A Century of Lighting Innovation	13
6. Diversifying Brightness: OSRAM's Product Portfolio	14
7. A poor financial trajectory: OSRAM's failed transformation plan	16
8. Shining a Light on Market Dynamics: The LED Revolution	20
9. The Acquisition Game: Bidding for OSRAM	22
10. Reasoning behind the Deal	25
11. Crossroads of Decision: AMS's Strategic Dilemma in Acquiring OSRAM	28
EXHIBITS LIST	33
EXHIBITS	34
BIBLIOGRAPHY	54
INDIVIDUAL PART	64
Case Synopsis	64
Learning Objectives	64
Target Audience	65
Teaching Plan	65
Assignment Questions	66
Analysis	66
References	79
Appendix List	81
Appendix	82

GROUP PART

1. Setting the Stage: AMS' ambition

On the evening of September 3rd, 2019, a sleepless night gripped Alexander Everke, CEO of Austria Mikro Systeme International GmbH (AMS). The day marked the company's latest attempt to acquire a substantial stake in OSRAM Licht AG (OSRAM), a leading entity in the lighting industry. Everke, known for his strategic acumen, wrestled with the uncertainty of their latest move in the public markets. "Were we able to secure enough equity to succeed in the takeover bid?" he continuously asked. The initial response, indicating that only 20% had been secured, with an additional 9% committed by other shareholders, was a mix of hope and apprehension.

The unfolding of events later in the week would justify the concerns, as news painted a different picture, one fraught with challenges and strategic obstacles. The intense corporate battle for control over OSRAM was far from over, as in a surprising twist, AMS's bid fell short, missing the target stake in OSRAM by a mere 11 percentage points. This narrow miss, while not a devastating blow, left a significant gap – a window of opportunity for other potential acquirers, notably Bain Capital, now with a new strategic partner, Advent Capital, who remained a persistent and intimidating competitor in this high-stakes acquisition game, with no signs of backing down.

Everke now faced a crucial dilemma: should AMS escalate their bid in a decisive move to outmaneuver the competition, or had they already stretched to the limits of a reasonable offer? The value that OSRAM could potentially add to AMS's portfolio was undeniable, but at what cost? The stakes were high, and the consequences of further action, or inaction, were complex and far-reaching.

For AMS this was a moment of strategic importance, but it was also a test of leadership and strategic foresight for its CEO, Everke. Known for his exceptional track record and revered

status within AMS, he was aware that the decisions made in the coming days would not only shape the future of AMS but also potentially solidify his already legendary reputation within the firm.

His next steps would now require careful consideration and a clear understanding of what was at stake, focusing on understanding the market's history and dynamics, the actions of competitors, and, above all, the real value OSRAM could bring to AMS.

2. Illuminating the Industry: A Historical Perspective on Lighting and Semiconductors

Light has significantly shaped the evolution of the human species, with the first use of controlled fire, in the 17th millennium BC. Millenia later, during the first Industrial Revolution, in the 18th century, several inventors recognized the potential of electric lighting, but Thomas Edison's successful commercialization of the incandescent light bulb truly transformed the world's approach to illumination. Its widespread adoption paved the way for modern lighting systems and through continuous improvement of patents, over the next centuries, innovation flourished, greatly enhancing energy efficiency, longevity, and adaptability.

At the same time, during the 19th Century, another great discovery would come to revolutionize the World: Semiconductors. Initially serving as converters for alternating current into pulsating direct current, they evolved into transistors and diodes, in the 20th century, revolutionizing electronic circuit production and giving birth to the integrated circuit (IC), today all around us, in our computers, smartphones, cars, etc. and an indispensable piece of society as we know it. The late 19th and 20th centuries saw the lighting and semiconductor industries undergoing substantial evolution, paving the way for the rise of major companies. This period was marked by significant innovation and development, but a key similarity emerged: the industries saw

extensive consolidation among their major players, primarily driven by spinoffs, restructurings, mergers, and acquisitions.

The lighting sector presents a notable instance of this trend. In 1882, the merger of Edison General Electric and Thomson-Houston Company laid the foundation for the enduring presence of General Electric Company, a giant still present today. In 1919, Auergesellschaft, Siemens, and AEG would merge their lighting subsidiaries to establish OSRAM, a strategic move aimed at competing with Dutch rival, Philips, which had recently undergone a substantial capital infusion and modernization of their machinery. In more recent years, in 2012, Eaton, an industrial manufacturer, were to acquire Cooper Industries, a manufacturer with emphasis on lighting solutions, which was later sold, in 2020, to Signify, the company resultant of a spinoff of Philips' lighting division.

It is interesting to notice, however, that, historically, this high level of Mergers and Acquisitions (M&A) often led to the formation of cartels, at both regional and global levels, with the most prominent example being the Phoebus Cartel. As a consequence, concerns about anti-competitive practices and monopolistic behavior in the industry would be raised by regulators, prompting scrutiny and interventions, and giving origin to the first governmental standards in the lighting industry. Post the era of the Phoebus Cartel, regulators began to closely monitor M&A activities in the industry, ensuring fair competition by considering several key factors: minimal overlap in the product portfolios and market shares of merging entities, the presence of alternative products and the feasibility of new market entrants, dynamic market conditions that foster continuous product evolution, and the involvement and perspectives of various stakeholders.

In the semiconductor industry, although no remarkable case of cartels ever existed, industry players also saw their share of transformative deals. In 2000, Burr-Brown, pioneer and leader in many analog semiconductor products and techniques, was acquired by Texas Instruments for

a whopping \$7.6 billion. In 2004, Freescale was created as the result of the divestiture of Motorola's Semiconductor Products Sector, later being privatized in 2006 for \$17.6 billion and subsequently merging with NXP Semiconductors in 2015 for \$11.8 billion. More recently, in 2017, Intel acquired Mobileye for \$15.3 billion and Analog Devices purchased Linear Technology for \$14.8 billion, underscoring the ongoing consolidation trend in the market and mirroring the motivations observed in the lighting industry.

This surge in deal-making across both industries can be attributed to a combination of a multitude of common factors that started to exponentially increase in the last century. Continuous innovation has always been central in both industries for their growth, even a matter of survival: the ever-shorter product life cycles mean slower innovating companies will be left behind. In turn, this translates into Intellectual Property's skyrocketing importance, not only as a defensive mechanism, but also to providing strategic opportunities to navigate the competitive landscape and create additional revenue streams, being one of the main drivers behind M&A dealmaking. Furthermore, looking at the semiconductors industry as a benchmark, to achieve the gains Moore's Law predicted (a doubling of the number of transistors in IC's every two years) a parallel doubling in Capital investments is required to double the power of a computing chip. Companies in high-tech fields, like semiconductor and lighting industries, are, then, more likely to merge as a means of decreasing costs in future R&D expenses and/or acquire already patented products at a lower cost. M&A dealmaking in the semiconductor industry can also be driven by a desire to acquire complementary technologies, expand market share, gain access to new markets, or acquire talented personnel.

3. AMS: Navigating the Semiconductor Terrain

Austria Mikro Systeme International GmbH. (AMS) was founded in 1981 as a result of a joint venture between American Microsystems Inc. (AMI), a well-established American

semiconductor manufacturer and technology company, known for producing microcontrollers, integrated circuits, and other semiconductor products and VOEST Alpine AG (VOEST), a major Austrian steel and technology conglomerate which was an important player in the global steel market. At that time, the semiconductor industry was highly competitive and there was growing demand for specialized semiconductors solutions in industries such as automotive, industrial automation, and consumer electronics. (*Exhibit 1*)

Despite having different objectives – AMI wanted to provide its clients with advanced sensor solutions in a broad range of industries, whereas VOEST wanted to diversify its core business from steel production - both players realized that Austria (with a strategic location in the center of Europe, well-established infrastructure, skilled engineers and high volumes of R&D investment from the government) was a very attractive location to create a company specialized in the development and provision of semiconductor solutions.

In 2019, the company had grown to become a worldwide leader in its three main product lines (Optical sensing, Imaging and Audio Sensing) that supplied products for two different business segments: Consumer and Automotive, Industrial and Medical (AIM).

Optical Sensing, in particular 3D sensing, was the most important driver of medium to long-term growth. The company supplied leading smartphone manufacturers with face recognition, authentication, and lighting sensors. In 2018, AMS unveiled a transformative technological advancement known as “behind OLED (BOLED) sensing”, that allowed manufactures to produce a new generation of smartphones with expansive screens and virtually bezel-free design. By leveraging these capabilities on the Consumer segment, the company was actively pursuing pioneering solutions in autonomous driving systems and medical health solutions that allowed individuals to monitor key personal health indicators in real time.

Within **Imaging**, the company held a leading position in advanced global sensors solutions in medical imaging and global shutter sensor technology, with important applications in digital X-Ray, mammography, and traffic control, for example.

AMS also held a strong position in **Audio Sensing** solutions, which were related to active noise cancelling technologies for consumer devices such as earbuds, earphones, and headsets, being particularly strong in the growth market for true wireless stereo earbuds.

4. Leap Forward: Everke's Era of Innovation and Growth

When Alexander Everke was appointed CEO in October 2015, a well-defined objective was set in motion: to position AMS as the preeminent global force in sensor technology across four swiftly expanding sensing markets, namely Optical, Imaging, Environmental, and Audio Sensing. In tandem with this strategic vision, the company outlined highly ambitious financial targets, encompassing a robust 30% Compounded Annual Growth Rate (CAGR) through 2019, culminating in a milestone achievement of reaching €1 billion in revenues. Simultaneously, a target of sustaining a 30% EBITDA margin from 2019 onwards was also established. Everke's own statements underscored his enthusiasm for the new leadership role and his confidence in a successful tenure: *“This is an exciting time to lead AMS. Sensors touch almost every aspect of our lives – from smartphones to wearables, Internet-of-Things (IoT) devices, industrial applications and connected vehicles – and AMS is poised for further growth with our portfolio of industry-leading sensor technologies.”*. The new CEO brought 25 years of experience in the semiconductor industry with former senior executive positions at Siemens, Infineon and NXP Semiconductors with an academic background in electrical engineering and international business.

Indeed, when Everke began his mandate in March 2016, he could hardly have dreamed that the first 2 years would unfold so favorably. In 2017, the company achieved the ambitious goal of

attaining €1 billion in revenues, accelerating its realization by two years. Annual revenues grew by 93%, driven by the large adoption of 3D and light sensing by high-end manufacturers like Samsung and Huawei. As a result, the consumer segment registered a remarkable 161% annual growth of sales and accounted for 69% of total turnover. **(Exhibit 2)**

At the same time, the new leadership embarked on an aggressive M&A strategy, marked by several acquisitions over the two-year period that significantly contributed to these developments. **(Exhibit 3)** First, the acquisition of Heptagon, in October 2016, for over €524 million, a globally renowned leader in high-performance optical packaging and micro-optics, positioned AMS as the undisputed global leader in end-to-end optical solutions, in Everke's words: *"Combining AMS and Heptagon creates the clear #1 in optical sensing technologies and fast-tracks our innovation capabilities. As a result, we expect AMS to drive the optical sensing agenda in the years to come and broaden its market reach."* Second, in March 2017, the acquisition of Princeton Optronics, Inc., a prominent provider of high-performance Vertical Cavity Surface-Emitting Lasers (VCSELs), unlocked substantial growth opportunities in smartphone and automotive 3D sensing, for which VCSEL confer considerable competitive advantages. As stated by AMS CEO, *"Princeton Optronics is an integral strategic partner for ams/Heptagon in the realm of optical sensing products, and we anticipate numerous potential synergies arising from this exciting amalgamation"*.

Apple's CEO, Tim Cook, ignited a wave of excitement as he unveiled the iPhone X, hailed as *"the product that will set the path for the next decade,"* marking a profound milestone, in September 2017, a decade after Steve Jobs introduced the first iPhone. Behind the impressive 5.8-inch all-screen OLED display and the groundbreaking 3D Facial Recognition technology lay the brilliance of AMS's technology, being the device that reimagined the smartphone landscape and pushed the boundaries of technological innovation.

The product launch was a tremendous success, with consumers clamoring for the iPhone X, leading Apple to anticipate its most profitable quarter in corporate history, a wave of success that AMS also rode. **(Exhibits 2 and 4)** After emerging as one of the top-performing stocks in European equity markets that year (204% growth year-over-year (YoY)), AMS revised and elevated its growth projections in early 2018, setting an ambitious target of 60% CAGR on revenues until 2019, i.e., €2.2 billion, and a 30% EBIT margin starting from that year, which would surpass industry peers significantly. **(Exhibit 5)**

2018 was marked by a period of notable expansion, although it also presented its fair share of challenges. Unforeseen and rapid fluctuations in consumer demand, particularly, impacted the consumer business segment. For the first time, the smartphone industry experienced an unprecedented contraction characterized by a significant decline in demand, as global smartphone shipments contracted 4% YoY. **(Exhibit 6)** This decline in smartphone demand was primarily attributed to lengthening replacement cycles, particularly evident in developed markets, the absence of groundbreaking innovations and higher price points. For example, the new iPhone started at \$999 versus \$649 for the iPhone 7. As a result, during the early stages of the second half of 2018, Apple initiated discussions with its suppliers, urging them to reduce the production of iPhone components destined for the market's year-end offerings by as much as 20%. This development sent ripples across Apple's supply chain, particularly impacting several key suppliers like Qorvo, Lumentum or TSMC which reported earnings and revenue guidance below initial expectations for the year.

As anticipated, AMS was notably impacted by this situation, with the share price declining 74% YoY and a revenue growth of 34%, clearly below the consensus estimate by Analysts. Also, the increase of the Net Debt/EBITDA ratio from 1.65x in 2016 to 3.71x at the end this year was a major concern for investors. **(Exhibit 2)**

Xiaomi was the fastest growing smartphone producer, selling a record 119 million units in 2018, despite the industry decline. In July, AMS made a significant announcement, revealing its role in powering the first-ever Android smartphone with a facial recognition solution for Xiaomi's Mi8 model, which was an extension of their partnership established in 2014 when Xiaomi began incorporating AMS's sensor solutions in various smartphone models.

In the first half of 2019, AMS capitalized on the booming demand for OLED-equipped bezel-less smartphones among Android manufacturers and the production of the Mi8 smartphone, recording a strong financial performance, with operational profitability improvements. (*Exhibit 2*)

For the remaining part of the year, the management board maintained a positive outlook, with the anticipation of achieving annual revenues exceeding \$2 billion - “*we see a more stabilized consumer demand and smartphone demand*”, the CEO stated - along with an EBIT Margin of 25%, very close to the long-term financial targets to be achieved by 2020. Additionally, they aimed to significantly reduce the net debt to reach a target level of Net Debt/EBITDA of 2x. (*Exhibit 2*)

5. OSRAM: A Century of Lighting Innovation

OSRAM Licht AG's story began in 1906 when it was established in Berlin, as a trademark for the incandescent lamp developed by Carl Auer von Welsbach. Following the merger of the lighting business of Auergesellschaft, Siemens & Halske and AEG, OSRAM as a company was established in 1919, with its name being derived from "osmium" and "wolfram" (the German word for tungsten), two elements used in early lamp filaments.

The company developed both a vertical and horizontal structure by acquiring and establishing facilities capable of efficiently producing every component required for lamp manufacturing, while expanding them abroad.

It's more than a century of existence was marked by a series of industry leading developments alongside some hard times, especially during the World War II when it was forced to produce equipment for military applications, navigating through shortages in raw materials and qualified labor. The first post-war lamp was produced in 1945, taking OSRAM just four years to deliver more than a million other fluorescent lamps. The aftermath of the war became remembered by the famous slogan "*OSRAM – hell wie der lichte Tag*" ("*OSRAM as bright as day*") becoming a symbol of Germany's peacetime.

Until the late 1980s, the company had established a European and South American footprint, through a network of sales offices and founded subsidiaries, but it was only in 1993 that OSRAM entered the American market, through the acquisition of Sylvania North American Lightning. This move pushed OSRAM's World market share from 14% to 20% overnight while also increasing their annual revenues by 70%, something deemed unachievable for any organization at the time.

During the following years, the company ended up going through a period of fast innovation, developing technologies such as the halogen lamp used in automotive headlights and film projection, as well as the light-emitting diodes (LEDs) which were widely used both in commercial and industrial settings due to higher energy efficiency. By the early 2000s, OSRAM had emerged as the globe's second-largest manufacturer of LEDs and was launching their new chip offering as the market for technologies like opto-semiconductors was taking off.

6. Diversifying Brightness: OSRAM's Product Portfolio

After restructuring with the intention to strengthen the strategic focus on "*digitalization and markets of the future*", OSRAM was positioning itself closer to a "*high-tech photonics company*" rather than just a lightning manufacturer, by concatenating their segment structure in 2019 and dividing each business unit by application: opto-semiconductors (OS), automotive applications (AM) and digital applications (DI).

Opto-semiconductors are devices that combine elements of both optics (light) and electronics (semiconductors) to control or manipulate light for various applications. OS offers an extensive portfolio of LEDs across various power categories with the product range extending to infrared, laser, and optical sensors. These products find their applications in fiber optic communication systems, regular displays and lighting, photodetectors, and medical devices. OS alongside the Japanese Nichia were still the front runners in the highly competitive opto-semiconductors market, where the key competitors arise mainly from Asia (strongest market for this business unit) featuring companies like Samsung and LG Innotek.

On the **Automotive** business, OSRAM developed and manufactured a variety of lightning solutions through lamps/modules and sensors to be sold in partnership to Original Equipment Manufacturers (OEMs) and their suppliers, as well as players in the after-market automotive environment. The offer ranged from headlights, taillights, fog lights and interior lighting, to the more advanced LED and laser systems, which provided energy-efficient and high-performance lighting solutions. This innovation path led to the more recent adaptive lighting systems and sensors, which improved driver safety and comfort by being able to adjust the beam pattern and intensity based on driving conditions.

The automotive sector was characterized by a stringent regulatory environment and an intensely competitive market landscape which compelled OSRAM to focus on the energy efficiency, durability, and safety of its products. This focus was complemented by a commitment to eco-friendly lighting solutions, aligning with the increasingly prominent trend towards sustainability. Key competitors in the industry include established firms such as General Electric and Lumileds, along with NICHIA, a prominent Japanese company that poses considerable competition to OSRAM. (*Exhibit 7*)

Lastly, the **Digital** business unit was established in the fiscal year 2018, designed to consolidate all the company's operations that were optimally situated to leverage the rapidly growing

importance of digital technologies and intelligent lighting solutions. Digital comprised the products and solutions from the former independent Specialty Lighting and Digital Systems business units, whose consolidation brought together a diverse range of offerings, including stage, cinema, and studio lighting systems, LED-based plant cultivation systems, and lighting solutions tailored for medical and industrial uses. Additionally, it encompassed innovative products like LED modules and light management systems, integrating these lighting solutions into the Internet-of-Things (IoT) ecosystem.

These solutions leveraged digital technologies to enhance lighting control, boost energy efficiency, and improve the overall user experience. In the digital domain, its main competitors were Asian companies such as LG, Inventronics, and Delta Electronics. Notably, DI distinguished itself from the remaining business units given that a significant portion of its revenue was generated from the Americas, particularly North America.

7. A poor financial trajectory: OSRAM's failed transformation plan

In the autumn of 2014, OSRAM found itself at a pivotal crossroads. The company, grappling with the relentless shift in market preferences towards more energy-efficient lighting solutions, announced the appointment of Olaf Berlien as its new CEO/CTO on November 5th. Berlien, a former board member of major European industrials, was considered as a strategic mastermind, able to navigate the complexities of rapidly evolving technological markets. This optimism was not only shared by the supervisory board but resonated through the market as OSRAM's shares experienced a 3.4% surge, a ripple of confidence boosted by quarterly results that surpassed expectations.

The journey ahead for OSRAM, under Berlien's leadership, was nothing short of arduous. The company was at a crucial juncture, facing the inevitable decline of traditional lighting markets. Consumers, driven by an appetite for sustainability, were rapidly transitioning to LED and

halogen solutions. This shift was intensified by the emergence of low-cost, chip-based technologies from competitors like Samsung Electronics and Toyoda Gosei, further challenging OSRAM's traditional stronghold.

In response to these market forces, OSRAM embarked on a significant restructuring journey, one that was both painful and necessary. By mid-2014, this path led to substantial cost savings and a considerable reduction in the workforce, trimming the company's size by nearly 17,000 employees. But the most transformative change was still on the horizon.

A few months into his tenure, Berlien steered OSRAM towards a momentous decision: the divestment of its general lighting lamps business. This bold move, culminating in the €500 million sale of this division as LEDVANCE in 2017, was a clear signal of the company shedding its old skin to embrace modernization. The numbers painted a stark picture of this transition: sales of traditional lamps had plummeted by nearly 10% YoY. In stark contrast, the segments of LED-based lamps/systems and Opto-semiconductors were thriving, boasting increases of 70% and 9%, respectively.

As highlighted by the board: *"The lamps market is a volume market in which consistently high quality and cost efficiency are crucial competitive factors. It differs fundamentally from the technology markets, which are characterized by innovation, tailor-made solutions, and sustainable growth. OSRAM intends to focus on these technology markets in the future through its businesses with opto-semiconductors, automotive and specialty lighting as well as luminaires, lighting systems and solutions."*

The stage would be set for OSRAM to change what had been 100 years of a straightforward sales approach into a new business model, in what would be the most profound change seen in the company since its origin. Under the visionary leadership of Berlien, the company presented the ambitious "Diamond" initiative, a strategic pivot aimed at transforming OSRAM into a cutting-edge photonics powerhouse. This journey would be marked by a daring investment of

€1 billion to construct a state-of-the-art LED chip plant in Malaysia and an additional €2 billion funneled into R&D. By 2020, this strategic overhaul was projected to rocket the company's revenue and EBITDA CAGR to 8% and 9%, respectively, and quintuple its LED chip production capacity.

However, the market's reception to this move was less than welcoming. Upon the announcement, OSRAM's shares took a steep 25% dive, reflecting investor apprehension over the perceived high costs and risks associated with this strategic redirection. In their perspective, the pivot steered OSRAM towards the highly competitive and commoditized general lighting market, dominated by Asian players, moving away from its profitable niches in the automotive and specialty lighting sectors. This shift, especially after shedding its waning Lamps unit, was a gamble, raising eyebrows among key stakeholders. *(Exhibit 9)*

Siemens, the company's largest shareholder owning 18%, voiced significant concerns. Despite numerous dialogues with OSRAM's management, the Siemens CEO remained skeptical, cautioning that this strategic shift could markedly increase OSRAM's risk profile.

Ironically, this period of strategic upheaval and market skepticism coincided with a robust demand for OSRAM's automotive and semiconductor products. In 2016 and 2017, these segments witnessed revenue surges of 6% and 9%, respectively. Profit margins remained steady, and remarkably, the company's valuation doubled from its late 2015 levels, despite an overall small positive currency-related impact. By the end of 2017, OSRAM's stock reached an unprecedented peak, soaring to €77 a share in December – a staggering 100% increase from its bottom in 2015/2016. Despite the initial backlash and market trepidation, OSRAM's resilience and performance told a story of a company undeterred, forging ahead on its path of transformation and innovation. *(Exhibits 9 and 10)*

Nonetheless, despite the company's promising trajectory, Siemens, its largest shareholder, harbored deep-seated reservations. Siemens viewed OSRAM's new strategy as a double-edged

sword, potentially delaying the company's results and jeopardizing its performance. In a strategic move, Siemens decided to capitalize on OSRAM's robust performance at the time, divesting its 18% stake in October 2017. This sale, amounting to a substantial €1.2 billion to institutional investors, marked the end of a longstanding alliance with the lighting titan, driven by differing visions for the future of the general LED lighting market. Little did they know the timing of this divestiture would be perfect, as the ensuing months would unveil a dramatic shift in OSRAM's fortunes.

As the calendar turned to 2018, the Chief Financial Officer, in a tone of cautious realism, briefed analysts and investors during a conference call. He set the stage for what was anticipated to be a year of stagnation, acknowledging, *"We affirmed our guidance for the year, but we have to say that it is a forecast that is certainly ambitious and is probably at the bottom of end of the guidance range"*. This acknowledgment was not just a casual remark but a harbinger of the challenges that lie ahead.

The year was marked by a confluence of adverse factors, creating a perfect storm for OSRAM. The company's aggressive investments in Asia, aiming to capture new markets, were met with escalating R&D costs. Simultaneously, currency fluctuations, particularly the strengthening of the Euro against the US Dollar, gnawed at the company's financial stability, given its heavy reliance on the Dollar for a substantial half of its revenues. The automotive exports market, once a robust pillar of strength, began to falter, further intensifying the strain.

In just six months, these factors culminated in a sharp decline of OSRAM's shares by a staggering 50%, mirroring the company's "muted business" activities. Behind the scenes, OSRAM was grappling with a dual-front battle: engaging in tough negotiations including over cost-cutting measures with the German workforce, while simultaneously striving to fuel its expensive Asian expansion, amidst a backdrop of continuously downgraded profit and growth projections for the year. (*Exhibit 9*)

Analysts from Jefferies shone a light on the internal challenges, noting, *“Slowing production rates and the rapid decline of legacy technologies such as Xenon are taking their toll and H2 car production will be weaker than OSRAM expected, particularly in Asia”*.

However, the real litmus test for OSRAM's strategy came with the arrival of 2019. The first quarter results painted a bleak picture, underscoring the struggles across all business units. The press release from the company was forthright in its admission: *“The weak operating performance is reflected in all three business units. For example, the Opto-Semiconductors unit recorded a 16.9 percent decline in revenue on a comparable basis in the first quarter. The reason for the disappointing revenue development is the accelerated market decline, especially in December 2018. Particularly affected were the core markets Automotive, General Lighting and Mobile Devices. Foremost, the ongoing trade conflicts, the weak growth in China and the general political uncertainties had a negative impact. As a result, visibility for the quarters ahead will remain significantly low”*.

This tumultuous period saw OSRAM's stock price take a dramatic plunge, halving from a robust €75.00 in January 2018 to a mere €35.00 a year later. This steep decline not only reflected the company's financial struggles but also marked a pivotal moment in its storied history, as it grappled with the realities of a rapidly evolving global market.

8. Shining a Light on Market Dynamics: The LED Revolution

As reported by Fortune Business Inside in 2019, the global lighting market reached a valuation of US\$ 118.33 billion in 2019, and was forecasted to expand to USD 163.72 billion by 2027, at a CAGR of 4,3%. A significant segment of this market, General Lighting — encompassing products like bulbs, tubes, modules, and luminaires — constituted 79% of the total market share, in 2019. A notable sub-sector within this market is traditional illumination, which maintained a stable market size of €5 billion and was anticipated to experience modest growth

rates of 4% up to 2023. This trend was largely driven by a shifting preference towards LED lighting, which was expected to surge from US\$ 69.7 billion to US\$ 98.5 billion by 2023. This expansion was projected to involve an increase in units sold, from the 2019 record number of 10 billion units to 14 billion units by 2022, representing a CAGR of 13.66%.

Several factors underlined this anticipated growth in the LED segment. Key among them was the ongoing global reduction in LED prices, coupled with rising living standards, particularly in densely populated countries like India and China. Government policies, driven by resource scarcity and climate change considerations, were also increasingly promoting LED adoption, a trend was particularly pronounced in the European Union, which had already enacted measures to phase out less efficient lighting technologies in favor of LEDs. Consequently, the European Lighting Market was projected to become the second-largest LED market globally by 2024, reaching a market size of USD 30 billion. This growth marks an increase from €16.3 billion in 2012 to €19.8 billion in 2020, positioning it just behind the United States — the largest importer and consumer of LED lighting. The U.S. market was anticipated to exceed USD 30 billion by 2022, with the value of imports growing by 6.5% compared to 2017. Meanwhile, China had already emerged as the world's leading exporter and manufacturer in this sector, significantly influencing global prices, in part due to government subsidies and incentives.

The lighting industry features a complex structure with diverse players, including hardware manufacturers, designers, and Original Equipment Manufacturers (OEMs). Among these, several Asian companies such as MLS Lighting, Nichia, and Everlight dominated in the manufacturing of Packaged Lights, with eight companies in the top 10, out of which 4 were Chinese. Europe is also a key player, represented by Lumileds and OSRAM as the 3rd and 4th largest producers, respectively. (*Exhibit 27*). Collectively, these top 10 companies command a substantial 48% of the global market share, indicative of a significant degree of market concentration.

9. The Acquisition Game: Bidding for OSRAM

After a poor achievement during the transformation process, OSRAM's precarious financial performance in the markets would not go unnoticed, swiftly drawing the attention of acquisition-hungry suitors, which at the time were closely monitoring the situation, and considering the strategic benefits of acquiring the beleaguered giant. Out of these, in February, Bain Capital, joined by the Carlyle Group, were the first to step into the spotlight, exploring a joint takeover bid of the venerable industry titan, in early 2019. **(Exhibit 11)**

In response to these circulating rumors, OSRAM's shares would go on to a robust rally, surging by 15% and, briefly, reaching €40.00 in the subsequent week. A short-lived resurgence, however, as the company's unsatisfactory performance persisted into the second quarter of 2019, reaching a negative EBIT margin of -4.54%, leading to a sharp decline in the stock price, hitting a record low of €25.00/share in June 2019, and valuing the company at €2.42 billion. **(Exhibits 9 and 13)**

After an extensive due diligence and an intensive negotiation process between both Private Equity investors and OSRAM, that did not find any regulatory constraints, Bain Capital and Carlyle took advantage of the news-related price swing, making the first voluntary public takeover offer: a *“premium of 27.7 percent over the volume-weighted average stock exchange price in the last month prior to 3 July 2019”*, meaning a cash offer of €35.00 per share and a total valuation of €3.4 billion, in July, 3rd. **(Exhibits 11, 12 and 13)** On top of that, the investment agreement also included *“(…) certain commitments by Bain Capital and Carlyle with regard to operations, material assets and employees of the Company, including existing works and collective bargaining agreements. The Investors intend to continue the constructive dialogue with OSRAM's employees which forms an integral part of the Company's culture.”*. The investors were looking forward to a swift conclusion of the transaction, which is a typical requirement in a high-tech sector deal, where the pace of innovation and market dynamics are

particularly rapid. Such urgency is driven by the need to capitalize on emerging technological opportunities and to minimize the financial and operational uncertainties that can accompany prolonged negotiations.

Around the same time, an unexpected player was to express their interest: AMS. The Austrian-based sensor manufacturer saw substantial potential in acquiring and integrating OSRAM into its operations, but significant challenges due to the disparity in size - AMS was around 3 times smaller than OSRAM - and the hurdles associated with securing the necessary financing were proving to be an obstacle in AMS's way. Without AMS formally bidding for OSRAM, securing takeover financing, or starting due diligence procedures, however, the management of OSRAM's management conveyed their support for the takeover proposal from Bain and Carlyle, acknowledging the advantages that such a deal could bring. OSRAM's CEO, Olaf Berlien, expressed this sentiment, stating: *"Bain and Carlyle are the right partners for OSRAM at the right time. They support our strategy and facilitate growth. Both are committed to our employees and offer shareholders an attractive premium."* (**Exhibit 11**)

Upon observing that Bain and Carlyle's takeover bid appeared to be favorably progressing towards acceptance, AMS reassessed its position regarding the potential transaction, issuing a statement indicating the change in their stance, *"(...) following an evaluation of recent developments AMS does not see a sufficient basis for continuing these discussions with OSRAM Licht AG"*.

A surprise was yet to strike, however, as, despite the management's endorsement, Carlyle's bid would not go on without facing considerable opposition from the major shareholders: Allianz Global Investments, holding a significant 9.3% of the total equity, and SdK Group, the latter representing the interests of over 440,000 individual investors and around 25% of OSRAM's equity, at the time. Both voiced strong dissents, underscoring their belief in OSRAM's future potential and technological prowess, firmly stating that, after all, *"there is upside potential for*

OSRAM and its technology in the foreseeable future” and they would not be tendering any shares as they found them “*worth more than €35 per share currently on offer.*”. Allianz Global Investments expressed a strong disappointment with OSRAM’s Executive and Supervisory Boards: “*AllianzGI finds it regrettable that they appear to have insufficient confidence in the business they are managing that they have chosen instead to sell out at what looks to be a knock-down price*”. With the votes of more than 34% of OSRAM’s Equity against the takeover, it would prove impossible for Carlyle and Bain Capital’s bid to move forward.

Following the significant backlash on the consortium’s bid, AMS changed its stance, and “*...decided to re-evaluate a potential transaction with OSRAM Licht AG. [...] AMS was recently approached by potential financial partners and has exchanged views which confirm its belief that AMS can arrange prudent and committed financing for this potential transaction*”.

For the first time, Everke and his team were showing preparedness to make the deal and, on the 12th of August, the Austrian company was offering €38.50 per share in a cash offer, representing, a 33% premium to the day prior to the first offer, a 10% premium to Bain and Carlyle’s offer. Furthermore, the deal already had fully committed financing: a €4.2 billion bridge facility, underwritten by HSBC and UBS, that would ensure immediate financial support for the transaction, with full permanent financing planned to be established after regulatory clearance, in the form of a €1.5 billion equity issuance and a €2.7 billion debt issuance, with “*expected credit rating in the BB area*”. AMS had also retained a significant portion of its Cash Flows during the previous year, as Excess Cash, which it was proposing to be used in the amount of €0.3 billion to finance part of the transaction.

These would allow AMS to acquire 62.50% of OSRAM’s equity, in junction with debt refinancing and transaction costs, which included legal fees, accounting fees, investment banking fees, due diligence costs, and other miscellaneous expenses. **(Exhibit 14)**

As a result, the leadership at OSRAM started to see the potential benefits of AMS's offer with both the managing and supervising boards at OSRAM showing their support for the bid, marking a major milestone for AMS. Nonetheless, OSRAM's CEO remained unconvinced, and stated that he would not tender any of his 31,750 shares in the case of AMS's bid.

Berlien's reservations stemmed from a clause in AMS's offer, which had no intentions in the continuation of OSRAM's IoT lighting segment, but rather focus on the synergies that could arise from the Photonics and Sensors departments, which Berlien stated to be doubtful about. In essence, it was a fundamental difference in perspective: he prioritized the long-term stability and resilience of OSRAM's existing business strategy, a strategy that he believed comprehensively catered to the interests of all stakeholders involved, while AMS believed that the two companies together could create a "*global leader in sensor solutions and photonics*". At the same time, unions and employee representatives, who, at the time, made up half of OSRAM's advisory board, were not convinced by the proposition made by AMS and voiced their concerns. They were unsure about AMS's planned savings from the deal, saying they would lead to job losses and facility closures in Germany, and believed that the PE funds were making better guarantees towards them.

10. Reasoning behind the Deal

Despite the challenges posed by its dependency on Apple, Alexander Everke, AMS's CEO, consistently conveyed optimism and confidence in the company's future. Throughout 2018, he announced new business opportunities with Android OEMs, demonstrating a proactive approach to diversifying the company's customer base. This strategic move aimed to mitigate the risks associated with overreliance on a single customer, a concern that undoubtedly weighed on Everke's mind.

While AMS has maintained a certain level of secrecy regarding the identity of its primary customer, industry analysts have approximated that the semiconductor manufacturer derives a substantial portion, estimated at, approximately, 40 to 45% of its total revenues from Apple. This significant reliance on one major client had a pronounced impact on AMS as evidenced by its less favorable performance in 2018. (*Exhibit 4*) The reduced demand for the iPhone X, which was eventually discontinued in September and replaced by the iPhone XS and the more affordable XR models, raised concerns among investors about the Austrian company's outlook. Therefore, acquiring OSRAM would significantly change AMS's current situation. It would mean a structurally improved revenue mix and an enhancement of business profile for AMS. As shown in *Exhibit 16*, adding OSRAM's automotive segment would balance AMS's income, making it the largest source of revenue ahead of the consumer segment in the near term, with both segments poised to contribute equally to the company's income in longer-term projections. This transition embodies a deliberate acceleration in diversifying revenue streams, allowing for a considerable scale-up in automotive products. Additionally, it would lead to a reduction in the customer concentration on the Consumer segment, mitigating risks associated with the dependency on Apple. Hence, this segment's growth would be fueled by delivering upon Android.

From a market coverage perspective, the acquisition would significantly enhance AMS market coverage and customer base (*Exhibit 17*). The merger would allow the combined entity to leverage AMS's strong ties with leading mobile, consumer electronics, and medical imaging manufacturers, along with OSRAM's established relationships with automotive and industrial sector clients. This strategic alliance was expected to facilitate a seamless and complementary go-to-market strategy, maximizing cross-selling opportunities, and creating a more comprehensive product and service portfolio. As a result, AMS-OSRAM would be best positioned to serve a combined customer base in all markets.

According to AMS, the merger was expected to generate at least €300 million in annual run-rate pre-tax synergies, expected to be fully achieved 3 years post-acquisition, while one-off integration costs were estimated to amount to €400 million. The €300 million, included both revenue (€60 million) and cost (€240 million) synergies (**Exhibit 18**), the latter mostly resulting from an enhanced manufacturing footprint and LED production consolidation in Regensburg (front-end) and Asia (back-end). (**Exhibit 19**)

AMS's vision was to create the global leader in sensor solutions and photonics, aiming to accelerate the standalone "*photonics champion*" strategy, being pursued by OSRAM and win in new breakthrough optical solutions by leveraging the acquired OSRAM's competitive advantages in Automotive. The strategy involved investing and growing the Opto-semiconductors and Automotive business segments, while divesting the Digital business. **Exhibits 20 and 21** provide OSRAM's board targeted financial performance per business segment presented in November 2018, when the strategy was reviewed and that served as a reference for AMS proposal.

On the opposite side, Bain Capital and Carlyle's position as private equity funds means they would not realize the synergies that AMS expected to gain from acquiring OSRAM, given the lack of an operational platform to extract the kind of strategic value that a merger between two complementary industrial players can achieve.

Nevertheless, both investment firms brought to the table more than 30 years of extensive experience helping management teams driving value to their portfolio companies. They have helped players accelerating growth and strengthening market positions in the industrial technology, semi-conductors, and automotive sectors, such as Sensata, NXP, Toshiba Memory, AZ Electronic Materials, Freescale Semiconductor, Axalta and Allison Transmission. As Dr. Michael Siefke, a Managing Director at Bain Capital Private Equity, said: "*The Company will*

benefit from our combined global network, deep industry knowledge and the comprehensive support we will bring to bear.”.

The consortium, in contrast to AMS, had no intention of changing the company’s current strategy but was aligned with the Management’s vision, aiming to fast-track the ongoing Strategic Plan focused on Digital and IoT, in particular. This would be in line with a growing tendency of private equity funds entering the lighting business, as is example, New York-based, American Industrial Partners, which, in early 2019, acquired Current, a solid-state lighting player for the commercial sector, with the goal of fostering the company’s push into smart lighting and IoT technologies.

The investment firms also believed that taking the company private was essential to accelerate it, without any short-term looking pressures from the public markets. *“Bain Capital and Carlyle believe in the long-term potential of OSRAM. We are prepared to support the Company over the long period of time it will take to master the comprehensive challenges it is facing. At this critical juncture in OSRAM’s strategic development, we are uniquely positioned as the right partners to assure a sustainably successful future for the Company and its stakeholders. Private ownership by Bain Capital and Carlyle will give OSRAM and its management the opportunity to focus on its transformation and strategy execution without distraction and ongoing pressures from the equity capital markets.”* as Gregor Boehm, a Managing Director at The Carlyle Group has put it.

11. Crossroads of Decision: AMS's Strategic Dilemma in Acquiring OSRAM

In a gripping turn of events, the Carlyle Group was to drop Bain Capital in the run for OSRAM: the group now found the risk of the deal to be too high. This would force the creation of a new consortium, between Bain and Advent Capital, which had taken ownership in a plenitude of other IoT-focused companies in the past and expressed their readiness to formulate a fresh

takeover bid for all outstanding shares, with the intention of conducting a thorough confirmatory due diligence in the ensuing weeks. The new consortium was pressed to be more fitting for OSRAM's strategic moves than AMS, as it was set on readapting, but maintaining the initial IoT-focused plan, and had previous extensive experience in venturing in similar industries.

In a calculated move, in September 25th, communicated through a letter to OSRAM's Managing Board (***Exhibits 11 and 22***), the new consortium hinted at a potential "meaningful" premium, strategically positioned to outshine the existing offer of €38.50 per share laid out by AMS. This intimation, while lacking a formal offer, cast a shadow of uncertainty over AMS's next steps.

As a result of this move and despite backlash from both the unions, workers' representants and the CEO itself, AMS did not stop itself from starting to acquire OSRAM' stock on the public markets, and during the weeks that followed the first offer, the Austrian chipmaker had spent more than €600 million to buy OSRAM shares over, becoming the largest single shareholder in OSRAM, with a 19.99% direct equity stake, surpassing Allianz GI. Any attempt by other investors to acquire OSRAM would now likely necessitate AMS's involvement in the transaction and market sentiment suggested that convincing AMS to relinquish its stake would be challenging for the private equity consortium, even with a significantly higher offer, due to AMS's strategic interest. OSRAM' publicly traded stock saw an unexpected free-float adjustment from the previous 97,11% to 77,12% as a result. (***Exhibits 9 and 13***)

This increase in the stance to approach OSRAM would culminate in the subsequent increase of AMS' previous public takeover offer, which was still in place, on September 27th to what was now a bid of €41.00 per share in a cash offer, in what they told to be the "*Best and Final*" offer for OSRAM. (***Exhibits 11, 12 and 13***) The German company was now being valued at €3.96 billion, and AMS was focused on outbidding all private equity funds and ensure a victory was

bound to happen.

Nonetheless, and against all expectations, OSRAM's shareholders decided to tender only 51.6% of the shares to AMS, with the latter not reaching the envisaged 62.5% minimum threshold for the takeover to be a success. This narrow miss, while not a devastating blow, now left a window of opportunity for the other potential acquirers, who remained persistent and preparing a new offer set to outbid AMS' efforts.

The challenge for AMS's CEO, Alexander Everke, and the Managing Board was clear yet complex: to consider an increase in their bid to counteract the financial investors' potential move, even after their "Best and Final" offer. A regulatory cooling-off period after such an offer could be easily circumvented with a new subsidiary, but the dilemma now extended beyond mere competitive bidding; it struck at the heart of the deal's financial framework. The original financing arrangement, predicated on the €38.50 bid per share, now demanded a careful revaluation. (*Exhibits 14 and 15*) OSRAM's deal was already a high-stakes play, with a high leverage factor that added considerable risk to the company's financial health. Any decision to issue new equity had wide-reaching implications for existing shareholders and required the board's careful consideration. Moreover, the potential integration of two disparate corporate cultures and different scales posed a coupling challenge to the board, which, despite thorough due diligence, still had a considerable risk of cultural discord and managerial difficulties. Complicating matters further, AMS faced continued skepticism from the unions and workers, who were still siding with the PE funds, and expressing concerns about job security against the backdrop of a workforce numbering 26,000. These continued calling Bain and Advent to stop playing "*capital market poker*" and substantiate their offer, to deter a buyout by any other bidder. As a response, AMS had already taken steps to address these apprehensions, promising to safeguard jobs, pledging more job creation than cuts, expanding the Regensburg

manufacturing site, and maintaining a commitment to R&D in Germany, but, despite these assurances, the workforce remained unconvinced, leaving Everke with the critical task of winning their trust.

Everke's leadership was now tested as he sought a strategy that would convincingly align the employees' interests with the company's bid, ensuring a united front as AMS ventured into this corporate battle. Furthermore, with the future of AMS depending on the outcome of OSRAM's bid, the managing board now had to deliberate the wisdom of escalating their offer. The board also had to make the difficult decision on whether they were in a sufficiently good financial position to continue bidding for OSRAM, i.e., the increased leverage and the issuance of a non-insignificant level of new shares would not impact the long-term growth prospects of the AMS, and the current shareholders in the company, and, above all, if the paid-in value would still allow for a significant return to AMS.

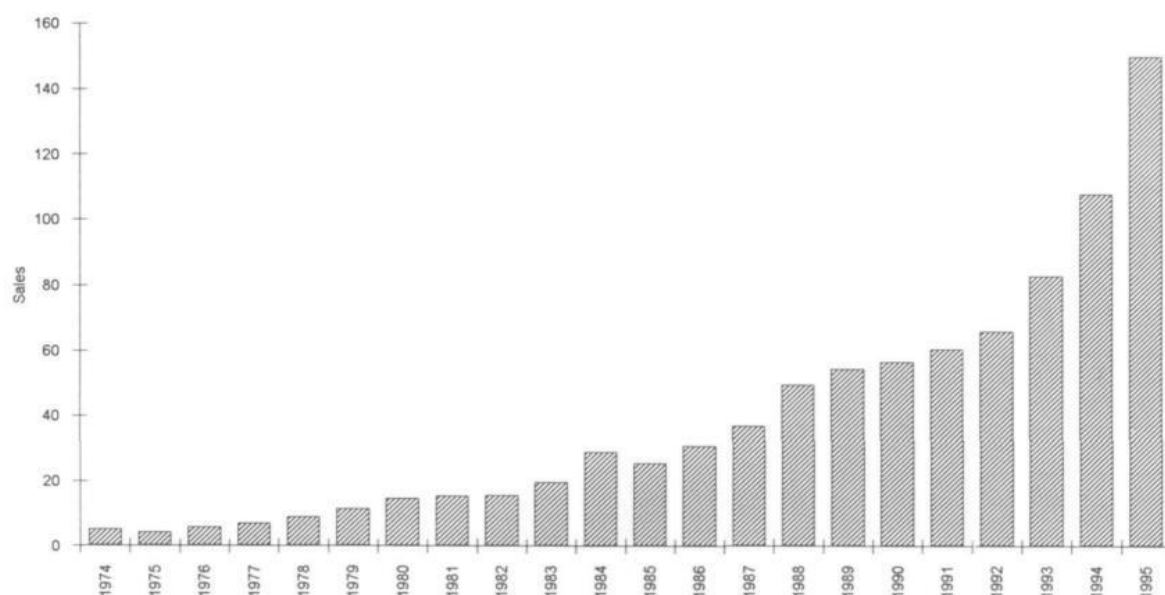
Although being well-versed in the high-stakes game of corporate acquisitions, Everke understands that the path forward is fraught with risk and opportunity alike. As he pondered the next move, he looked back, remembering his past successes to try to navigate through what was shaping up to be his most significant corporate challenge to date.

EXHIBITS LIST

Exhibit 1: The World Semiconductor Industry between 1974 and 1995 (in bn of \$)	34
Exhibit 2: AMS's Recent Financial Performance (in million of EUR).....	34
Exhibit 3: AMS M&A Activity.....	35
Exhibit 4: AMS Share Price Performance	36
Exhibit 5: AMS's selected peer group Recent Financial Performance (in million of CHF)....	36
Exhibit 6: Worldwide Smartphones' Shipment Evolution	37
Exhibit 7: Automotive Lighting and Lighting Industries Selected Players	38
Exhibit 8: OSRAM's Revenue Distribution by customer location	39
Exhibit 9: OSRAM's Share Price Performance	39
Exhibit 10: OSRAM's Recent Financial Performance (in million of EUR).....	40
Exhibit 11: OSRAM Acquisition Timeline	41
Exhibit 12: Summary of AMS and Bain Capital proposals for OSRAM's acquisition	42
Exhibit 13: AMS and OSRAM Share Price Evolution during the acquisition process between, June/2019-October/2019	43
Exhibit 14: AMS proposed financing structure for the OSRAM acquisition.....	44
Exhibit 15: AMS-OSRAM Pro-forma combined leverage and Transaction Value details for the €38.50/share offer price	45
Exhibit 16: AMS expected revenue mix after the acquisition	46
Exhibit 17: AMS and OSRAM individual go-to-market access.....	46
Exhibit 18: Expected annual run-rate of pre-tax synergies (in million of EUR).....	47
Exhibit 19: AMS and OSRAM Opto Semiconductors manufacturing footprint.....	47
Exhibit 20: OSRAM Financial Projections (in million of EUR).....	48
Exhibit 21: OSRAM Target Financial Performance.....	49
Exhibit 22: Recent M&A deals within the Lasers and Lighting Industries (million of EUR).49	49
Exhibit 23: Bain Capital and Advent Letter to OSRAM's Board of Directors.....	49
Exhibit 24: Average Debt Betas by Rating and Maturity	51
Exhibit 25: Cost of Capital Assumptions for AMS and OSRAM	51
Exhibit 26: Implied Credit Rating for large non-financial manufacturing firms	51
Exhibit 27: Ranking of the top 10 packaged LED manufacturers.....	53

EXHIBITS

Exhibit 1: The World Semiconductor Industry between 1974 and 1995 (in bn of \$)



Source: EIB

Exhibit 2: AMS's Recent Financial Performance (in millions of EUR)

	Fiscal Year Ending September 30				Nine months Ending
	2015	2016	2017	2018	September 30, 2019
Total Revenues: ⁽¹⁾	623	550	1 064	1 426	1 293
growth rate YoY	n.a.	-12%	93%	34%	
Consumer	408	279	730	1 008	
Automotive, Industrial and Medical (AIM)	215	270	334	418	
EBITDA ⁽¹⁾	195	156	224	322	354
EBITDA Margin	31%	28%	21%	23%	27%
EBIT	147	97	169	128	
EBIT Margin	24%	18%	16%	9%	
Effective Tax Rate (%) ⁽²⁾	6%	-8%	-20%	-2%	2%
Tax Incentives for R&D (%)	1%	6%	4%	3%	2%
Debt Metrics:					
LT Debt	200	364	672	1 599	1 703
ST Debt	75	108	586	220	258
Cash	144	216	312	625	800
Net Debt	132	257	946	1 194	1 161
Net Debt/EBITDA	0,68x	1,65x	4,22x	3,71x	3,28x
Market Capitalization (year end)	2 139	1 869	6 180	1 717	3 306
LT Debt/Equity	9%	19%	11%	93%	52%

Source: Company Reports; Bloomberg and Case writer Analysis

(1) EBITDA for 2019 calculated as the sum between the Result from Operations and Depreciation

(2) A Corporate Tax Rate of 25% adjusted for Tax Incentives was assumed to be a reasonable estimate for future tax expenses

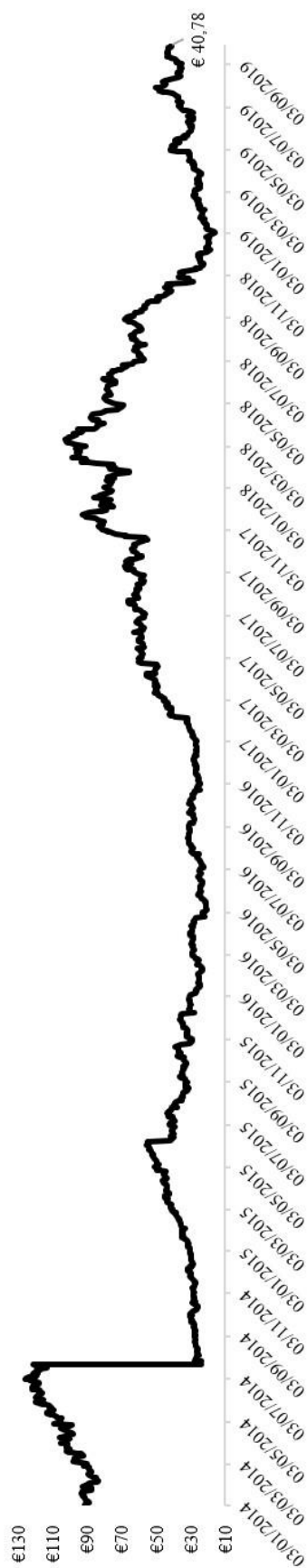
Exhibit 3: AMS M&A Activity

Announcement Date	Target Name	Seller Name	Announced Total Value (millions of EUR)	Payment Type
Acquisitions				
2/13/2018	KeyLemon SA	Debiopharm Group	N/A	Undisclosed
3/16/2017	Princeton Optronics Inc		50	Cash
12/19/2016	Incus Laboratories Ltd		N/A	Undisclosed
10/24/2016	Heptagon / ams Sensors Singapore Pte Ltd	Consortium of Investors (1)	524	Cash and Stock
7/26/2016	Mazet GmbH		N/A	Cash
6/16/2016	Cambridge CMOS Sensors Ltd		N/A	Cash
11/20/2015	CMOSIS Sprl	TA Associates Management LP	220	Cash
7/27/2015	CMOS Sensor business	NXP Semiconductors NV	N/A	Cash
12/04/2014	acam-messelectronic GmbH		N/A	Undisclosed
6/26/2014	Dialog Semiconductor Ltd		N/A	Undisclosed
06/04/2014	AppliedSensor GmbH	Verdane Capital Advisors AS	N/A	Cash
11/13/2012	IDS Group PLC		N/A	Undisclosed
6/16/2011	AMS-TAOS USA Inc		226	Cash and Stock
Divestitures				
Announcement Date	Target Name	Acquirer Name	Announced Total Value (millions of EUR)	Payment Type
11/15/2017	LED backlight technology portfolio	Dialog Semiconductor Ltd	N/A	Cash
7/29/2016	NFC & RFID reader business	STMicroelectronics NV	71	Cash

Source: Bloomberg

Note: (1) Sitra the Finnish Innovation Fund, Nokia Growth Partners Management Co Oy, GGV Capital LLC, High Tech Private Equity GmbH, InnovationsKapital Nordic Advisors AB ,Innovacom Gestion SAS

Exhibit 4: AMS Share Price Performance



Source: Bloomberg

Exhibit 5: AMS's selected peer group Recent Financial Performance (in millions of CHF)

Company	Market Valuation ⁽¹⁾			LTM ⁽²⁾ Financial KPIs					LTM Profitability Margins (%)					Coverage Ratios				EV/Revenues	EV/EBITDA	EV/FCF	P/E	P/FCF
				Enterprise Value (EV)	Revenue	Gross Profit	EBITDA	EBIT	Net Income	Gross Profit	EBITDA	EBIT	Net Income	D/E	Debt/EBITDA	Net Debt/EBITDA						
	Market Capitalization																					
ELMOS SEMICONDUCTOR SE	529	449	290	133	85	54	42	45%	29%	19%	15%	13%	80x	10x	1,55x	5,26x	8,27x	12,48x	100x			
ON SEMICONDUCTOR	7 869	10 671	5 831	2 213	1 361	833	596	37%	23%	14%	10%	36%	2,06x	1,39x	1,83x	7,84x	12,81x	22,55x	13,20x	16,63x		
SEMTECH CORP	3 227	3 154	624	384	162	113	63	62%	26%	18%	10%	7%	1,31x	-41x	5,06x	19,47x	27,88x	27,44x	50,93x	28,08x		
MELIXIS NV	2 793	2 800	627	281	187	138	116	40%	30%	22%	18%	2%	0,24x	00x	4,46x	14,99x	20,32x	38,24x	24,17x	38,15x		
CIRRUS LOGIC INC	3 109	2 776	1 174	592	179	100	89	52%	15%	8%	8%	0,00%	0,00x	-2,47x	2,36x	15,52x	27,82x	12,81x	34,93x	14,35x		
POWER INTEGRATIONS INC	2 647	2 412	398	205	71	47	62	51%	18%	12%	16%	0,24%	0,09x	-2,87x	6,06x	33,79x	51,05x	59,25x	42,42x	65,03x		
MONOLITHIC POWER SYSTEMS INC	6 716	6 301	589	326	126	112	109	55%	21%	19%	18%	0,03%	0,02x	-2,78x	10,70x	49,97x	56,22x	57,48x	61,87x	61,26x		
Mean	3 841	4 080	1 362	591	310	200	154	48,80%	23,31%	16,08%	13,59%	8,15%	0,65x	-1,00x	4,57x	20,98x	29,20x	31,11x	34,29x	31,93x		
Median	3 109	2 800	624	326	162	112	89	50,99%	23,33%	18,17%	14,63%	1,64%	0,24x	-41x	4,46x	15,52x	27,82x	27,44x	34,93x	28,08x		

Source: Bloomberg

- (1) As of 30/09/2019; selected Peer group based on Market Capitalization Size, i.e., companies operating in the same industry with a Market Capitalization significantly below CHF 1bn and above CHF 8bn were excluded.
- (2) Last Twelve Months; all figures refer to the twelve months prior to September, 2019

Exhibit 6: Worldwide Smartphones' Shipment Evolution

Player	Q4 2018 shipments (million)	Q4 2018 Market Share	Q4 2017 shipments (million)	Q4 2017 Market Share	Annual Growth
Apple	71.7	19.8%	77.3	20.0%	-7.3%
Samsung	70.3	19.4%	74.2	19.2%	-5.3%
Huawei	60.5	16.7%	41.1	10.6%	+47.3%
Oppo	31.8	8.8%	26.3	6.8%	+20.6%
Xiaomi	26.4	7.3%	27.2	7.0%	-3.0%
Others	101.8	28.1%	140.7	36.4%	-27.6%
Total	362.5	100%	386.9	100.0%	-6.3%

Source: Canalys Smartphone Analysis (sell-shipments), January 2019

Exhibit 7: Automotive Lighting and Lighting Industries Selected Players

Company	Market Valuation ⁽¹⁾		LTM ⁽²⁾ Financial KPIs					LTM Profitability Margins (%)				Coverage Ratios			EV/Revenues	EV/EBITDA	EV/EBIT	EV/FCF	P/E	P/FCF
	Market Capitalization	Enterprise Value (EV)	Revenue	Gross Profit	EBITDA	EBIT	Net Income	Gross Profit	EBITDA	EBIT	Net Income	D/E	Debt/EBITDA	Net Debt/EBITDA						
HELLA GMBH & CO KGAA	4 979	4 859	7 995	2 062	1 306	868	722	27%	13%	8%	9%	36%	1,36x	33x	,66x	3,94x	6,08x	14,93x	6,90x	15,30x
SCHAEFFLER AG - PREF	5 099	8 369	16 573	4 215	2 391	1 388	905	25%	14%	8%	5%	116%	2,47x	1,41x	,53x	3,95x	7,68x	17,52x	5,63x	10,68x
SIGNIFY NV	3 531	4 552	7 334	2 743	786	506	330	37%	11%	7%	4%	50%	2,23x	1,15x	,67x	5,93x	9,58x	8,04x	10,71x	6,24x
LEGRAND SA	19 076	22 106	7 065	3 664	1 594	1 336	912	52%	23%	19%	13%	22%	2,64x	1,86x	3,14x	13,59x	16,67x	20,22x	20,92x	17,45x
SEOUL SEMICONDUCTOR CO LTD	673	885	1 071	285	175	85	60	23%	16%	8%	6%	29,18%	1,12x	,92x	,92x	7,05x	15,68x	15,27x	11,20x	11,61x
EVERLIGHT ELECTRONICS CO LTD	395	367	752	177	96	27	25	22%	13%	4%	3%	27,26%	1,13x	-,82x	,54x	4,06x	16,59x	5,87x	15,59x	6,31x
LG INNOTEK CO LTD	2 250	3 507	6 839	732	695	210	125	8%	10%	3%	2%	84,49%	2,74x	1,95x	,54x	4,72x	14,14x	25,56x	18,00x	16,40x
FAGERHULT GROUP AB	960	1 381	663	255	122	81	56	39%	18%	12%	8%	86,37%	6,82x	5,76x	1,89x	10,25x	17,11x		17,26x	,00x
Mean	4 620	5 753	6 037	1 767	895	563	392	29,17%	14,85%	8,56%	6,39%	56,33%	2,56x	1,57x	1,11x	6,69x	12,94x	15,35x	13,28x	10,50x
Median	2 890	4 029	6 952	1 397	741	358	227	26,35%	13,93%	7,76%	5,54%	42,77%	2,35x	1,28x	,66x	5,32x	14,91x	15,27x	13,40x	11,15x

Source: Bloomberg

(1) As of 30/09/2019

(2) Last Twelve Months; all figures refer to the twelve months prior to September 2019

Exhibit 8: OSRAM's Revenue Distribution by customer location

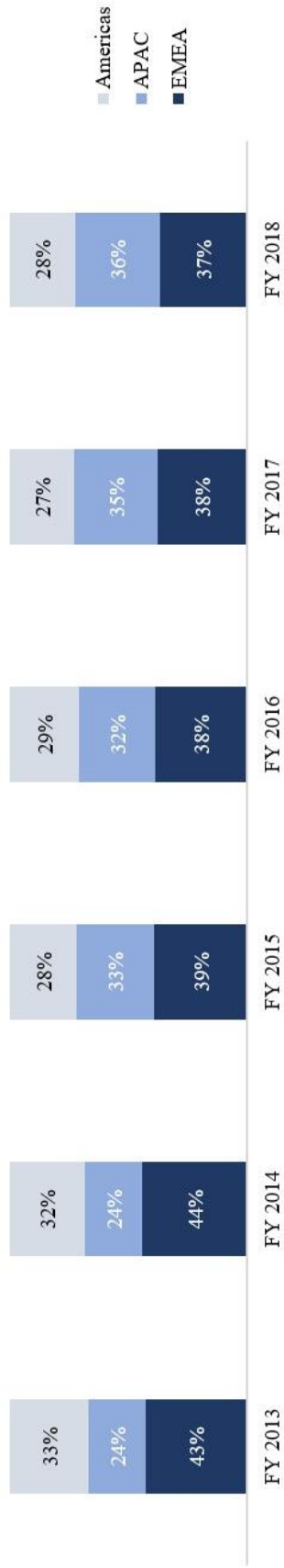
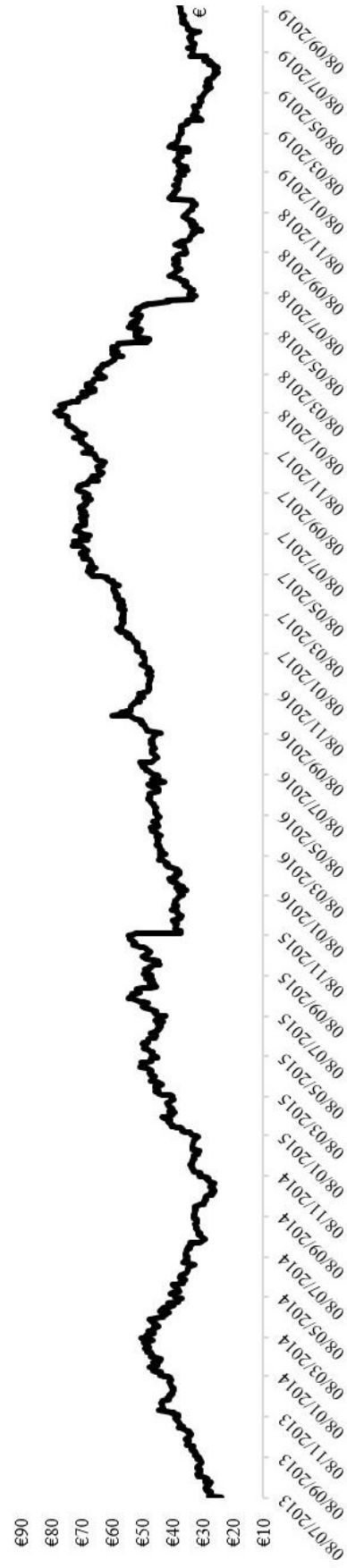


Exhibit 9: OSRAM's Share Price Performance



Source: Bloomberg

Exhibit 10: OSRAM's Recent Financial Performance (in millions of EUR)

	Fiscal Year			Nine months Ending June 30, 2019
	2015	2016	2017	2018
Total Revenues: ⁽¹⁾	4 098	4 442	5 022	4 979
Opto Semiconductors (OS)	1 292	1 424	1 685	1 725
External Revenues	767	801	831	861
Intersegment Revenues	525	623	854	864
Automotive (AM)	1 897	2 010	2 173	2 156
Digital (DI)	905	971	1 086	1 041
Revenue Adjustments ⁽²⁾	4	37	78	57
Reported Revenues (net of Intersegment Revenues)	3 573	3 819	4 168	4 115
Margins (% of Total Revenues):				
EBITDA	13,25%	13,96%	12,37%	6,19%
Adjustments to EBITDA ⁽²⁾	-2,15%	-1,92%	-1,92%	-2,18%
Net EBITDA Margin	11,10%	12,03%	10,45%	4,01%
Depreciation and Amortization	5,00%	4,73%	4,46%	5,38%
EBIT Margin	8,25%	9,23%	7,91%	0,80%
CAPEX	6,00%	7,88%	10,69%	9,38%
Corporate Tax Rate	30,10%	30,40%	30,10%	30,10%
Effective Tax Rate (% of EBT)	29,19%	24,11%	29,31%	27,92%
R&D Expenses	286	334	364	421
Non-Current Assets:				
Property, Plant and Equipment	1 115	1 060	1 396	1 621
Intangible Assets	210	190	290	665
Current Assets:				
Receivables	898	580	634	614
Payables	749	601	752	714
Inventories	987	655	662	743
Financial Ratios:				
LT Debt	50	42	184	152
Market Capitalization (year end)	3 383	3 805	4 454	4 478
LT Debt/Equity	1%	1%	4%	3%
Net Debt	-640	-395	-409	52
				424

Source: Company Reports and Case writer Analysis

Notes: (1) Given that the company changed the Business Segment distribution for reporting purposes in 2019, the revenue distribution per Business Segment was calculated assuming: the AM segment share of total revenues for 2018 (53.14%) would be similar in the previous years; OS reporting remained unchanged; DI was calculated as the difference between Total Revenues and the remaining business segments; (2) Mainly related to Corporate Items and Pensions as well as other elements for Financial Statement Reconciliation

Exhibit 11: OSRAM Acquisition Timeline

Date	Type of Event	Description	Players Involved	AMS	OSRAM
05/06/2013	Spinoff	OSRAM' Spinoff from Siemens AG	OSRAM, Siemens		
01/06/2017	Exit	Siemens AG exits 100% of OSRAM	OSRAM, Siemens		2,4%
01/06/2017	Strategy Update	OSRAM changes business focus to high-tech	OSRAM		2,4%
03/12/2018	Acquisition	Buyout specialists eyeing OSRAM	OSRAM, Bain Capital, Carlyle		
25/01/2019	Business Related	OSRAM warns of a weak first quarter as it cuts jobs	OSRAM		0,6%
08/02/2019	Business Related	OSRAM's quarter dives, orders could pick up in second half	OSRAM		-4,7%
13/02/2019	Acquisition	OSRAM confirms it's in talks to be acquired, and overhauls an IoT segment	OSRAM, Bain Capital, Carlyle		13,6%
28/03/2019	Business Related	OSRAM warns that 2019 revenue will tumble	OSRAM		-12,9%
08/05/2019	Business Related	OSRAM's poor Q2 financial results	OSRAM		-0,9%
08/05/2019	Business Related	OSRAM reports €91M loss in second quarter	OSRAM		-0,9%
27/06/2019	Exit	OSRAM sells Siteco	OSRAM, Siteco		
03/07/2019	Acquisition	AMS expressed interest in the deal	OSRAM, AMS	1,3%	18,7%
03/07/2019	Acquisition	Bain Capital and Carlyle make public market play to acquire OSRAM	OSRAM, Bain Capital, Carlyle	1,3%	18,7%
15/07/2019		Non-binding expression of interest by AMS to takeover OSRAM	OSRAM, AMS		6,1%
15/07/2019		OSRAM doubts AMS' financing capacity via ad-hoc	OSRAM, AMS		6,1%
16/07/2019	Acquisition	AMS loses interest in the deal	OSRAM, AMS		-5,5%
23/07/2019	Acquisition	AMS gains interest in the deal again	OSRAM, AMS	8,3%	3,5%
31/07/2019		Q3 losses mount at OSRAM as September takeover deadline approaches	OSRAM	-5,8%	2,0%
11/08/2019		AMS woops in with offer to buy OSRAM - and dump IoT lighting	OSRAM, AMS	-11,6%	10,7%
12/08/2019		Bain's takeover bid for OSRAM hits stiff resistance	OSRAM, Bain Capital, Carlyle	-11,6%	10,7%
03/09/2019		AMS takes its OSRAM acquisition to shareholders	OSRAM, AMS	1,3%	1,8%
10/09/2019		Unscheduled free-float adjustment of OSRAM Licht AG in MDAX	OSRAM, AMS	0,4%	-0,1%
16/09/2019		OSRAM's CEO at odds with OSRAM as company backs AMS takeover	OSRAM, AMS	-1,9%	0,3%
25/09/2019		Bain jockeys to raise its offer for OSRAM	OSRAM, Bain Capital, Advent	-0,3%	2,3%
27/09/2019		AMS volleys back in OSRAM takeover bid, raising its offer to €41.00/share	OSRAM, AMS	-2,1%	5,6%
04/10/2019		AMS falls short in bid to acquire OSRAM	OSRAM, AMS	2,3%	-4,3%

Source: Case writer Analysis; Reuters; Bloomberg; LEDs Magazine

Exhibit 12: Summary of AMS and Bain Capital proposals for OSRAM's acquisition

Date	01/02/2019	01/07/2019	12/08/2019	25/09/2019	25/09/2019
Event	Market Capitalization prior to the Bidding War	Bain and Carlyle Offer	AMS's 1st Offer	Bain and Advent's Potential Offer ⁽¹⁾	AMS's Offer Raise
Share Price	37,09 €				
Offer Value		35,00 €	38,50 €	40,00 €	41,00 €
# Of Shares	96 607 000				
Implied Valuation (in millions of EUR)	3 583	3 381	3 719	3 864	3 961

Source: Case writer Analysis

Note:(1) No formal offer was made. The consortium only hinted at a potential “meaningful” premium, strategically positioned to outshine the existing offer of €38.50 per share laid out by AMS

Exhibit 13: AMS and OSRAM Share Price Evolution during the acquisition process between, June/2019-October/2019



Source: Bloomberg

Exhibit 14: AMS proposed financing structure for the OSRAM acquisition

Sources (in billions of EUR)		
Debt issuance ⁽¹⁾	2,7	(60%)
Equity issuance ⁽²⁾	1,5	(33%)
Excess cash	0,3	(7%)
Total	4,5	(100%)
Uses (in billions of EUR)		
OSRAM offer value ⁽³⁾	3,7	(83%)
OSRAM Net Debt refinancing ⁽⁴⁾	0,4	(9%)
AMS Bank Debt refinancing ⁽⁵⁾	0,2	(5%)
Estimated Transaction Costs	0,1	(2%)
Total	4,5	(100%)

Source: AMS presentation to investors - "Proposed acquisition of OSRAM Licht AG", September, 2019; page 14
Notes:

(1) Primarily bond issuance; expected credit rating in BB area; part of a bridge facility with a total amount of €4.2bn fully underwritten by HSBC and UBS

(2) Primarily rights issue; issuance currency: CHF; fully underwritten by HSBC and UBS; part of a bridge facility with a total amount of €4.2bn fully underwritten by HSBC and UBS

(3) Offer price of €38.50/share multiplied by 96.8 million outstanding shares of OSRAM

(4) OSRAM Net Financial Debt as of 30/06/2019: €424 million (Long-term Debt: €128 million; Short-Term Debt: €578 million and Cash: €282 million)

(5) €235 million of AMS bank debt to be refinanced

Exhibit 15: AMS-OSRAM Pro-forma combined leverage and Transaction Value details for the €38.50/share offer price

Proforma combined leverage <i>in millions of EUR, unless stated otherwise</i>	€38.50/share
Acquisition Debt ⁽¹⁾	2 276
Refinancing OSRAM Net Debt ⁽²⁾	424
ams Net Debt ⁽²⁾	900
ams pensions (post-tax) ⁽³⁾	40
OSRAM pensions (post-tax) ⁽³⁾	122
Pro-forma Net Debt (Dec-19)	3 762
Pro-forma combined EBITDA (excl. synergies) ⁽⁴⁾	875
Pro-forma net debt / EBITDA (excl. synergies)	4,3x
Expected run-rate synergies	300
Pro-forma combined EBITDA (incl. synergies)	1 175
Pro-forma Net debt / EBITDA (incl. synergies)	3,2x
LT Target Net Debt / EBITDA for the Combined Firm	2,0x
Pro-forma Combined Depreciation (% of Revenues) ⁽⁵⁾	10%

Transaction Valuation Details <i>in millions of EUR, unless stated otherwise</i>	€38.50/share
OSRAM Shares Outstanding (in million)	97
Offer Price (€)	38,5
Offer Value	3 732
Cash Osram	282
Net Debt Osram	424
Minorities	120
Associates	-61
Pensions (pos-tax)	122
Adj. net debt ⁽⁶⁾	605
Transaction Value	4 337

Source: AMS presentation to investors - "Proposed acquisition of OSRAM Licht AG", September, 2019; page 20
Notes:

(1) €2.7 bn debt issuance net of quantum required to refinance OSRAM net debt

(2) AMS management estimate as of 31/12/2019

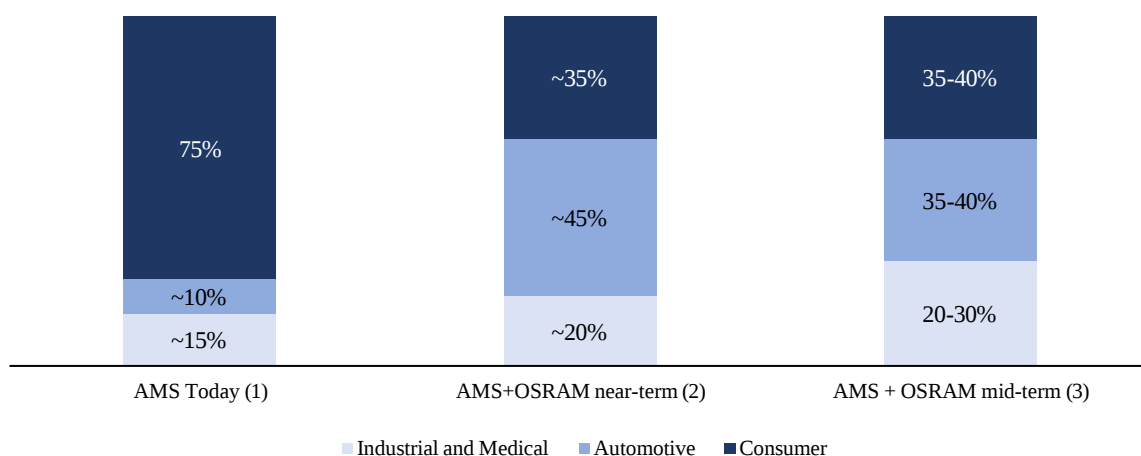
(3) Statutory Tax Rate used for Germany and Austria

(4) €850-900m pro-forma combined EBITDA based on analyst consensus and management estimates

(5) Case writer Assumption

(6) Reported as of 30/06/2019

Exhibit 16: AMS expected revenue mix after the acquisition



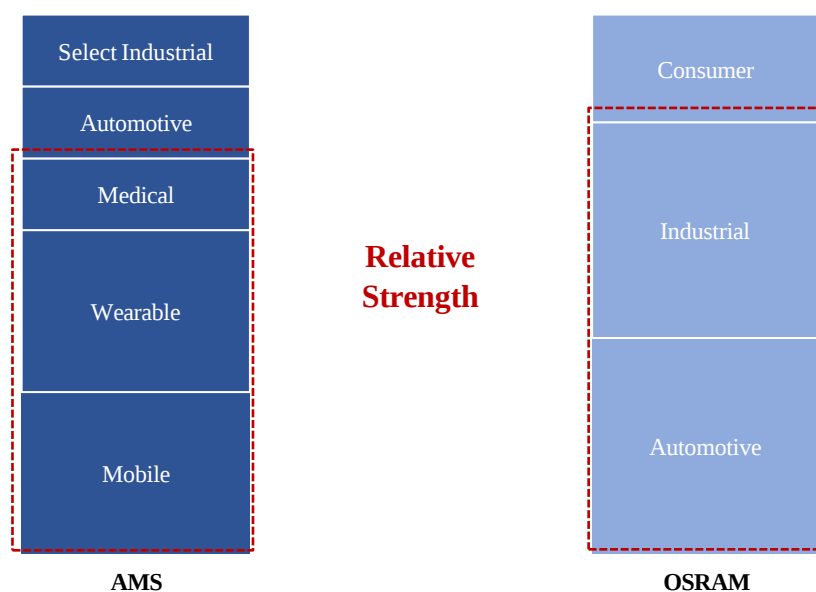
Source: AMS presentation to investors - "Proposed acquisition of OSRAM Licht AG", September, 2019; page 14
Notes:

(1) AMS revenue mix for H1 2019

(2) Pro-forma combined revenue mix based on latest reported segment split

(3) Pro-forma combined revenue mix expected for mid-term

Exhibit 17: AMS and OSRAM individual go-to-market access



Source: AMS presentation to investors - "Proposed acquisition of OSRAM Licht AG", September, 2019; page 11

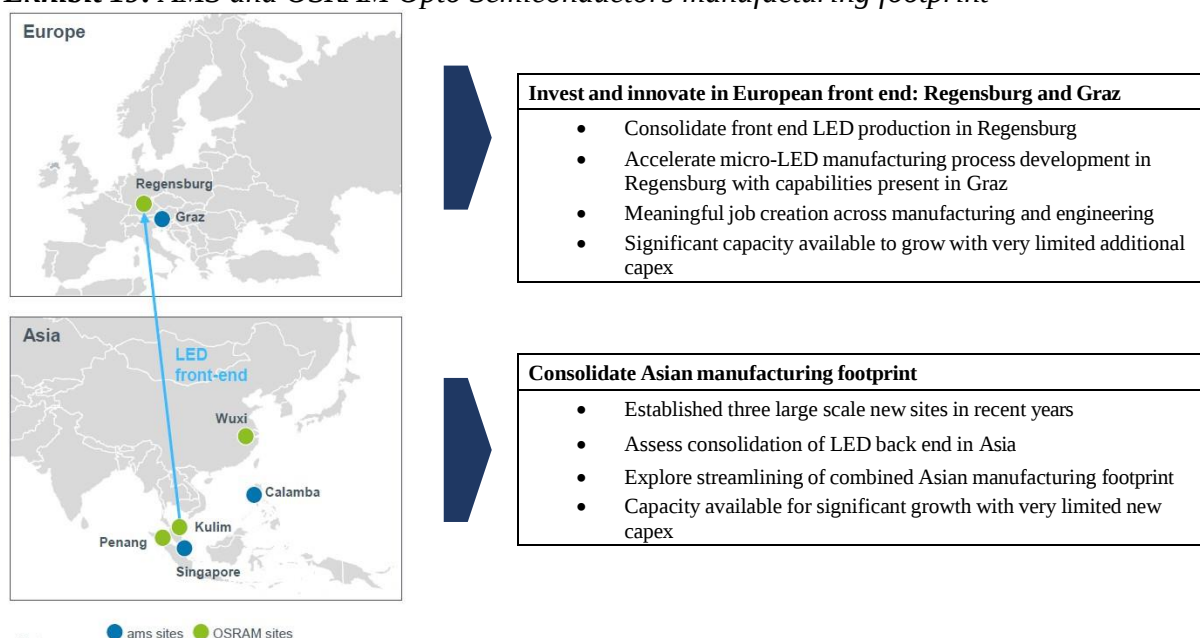
Exhibit 18: Expected annual run-rate of pre-tax synergies (in millions of EUR)

COGS Synergies	> 120
OPEX Synergies	> 120
Revenue Synergies	> 60
Integration Costs (one-off)	400

Source: AMS presentation to investors - "Proposed acquisition of OSRAM Licht AG", September,2019; page 12

Note: Run rate synergies expected to be achieved by year 3 post closing majority of synergies expected to be achieved within 2 years post-closing

Exhibit 19: AMS and OSRAM Opto Semiconductors manufacturing footprint



Source: AMS presentation to investors - "Proposed acquisition of OSRAM Licht AG", September,2019; page 10

Exhibit 20: OSRAM Financial Projections (in millions of EUR)

	Fiscal Year Ending September 30									
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Total Revenues:	4 505	4 786	5 086	5 406	5 748	6 075	6 381	6 660	6 906	7 068
<u>Opto Semiconductors (OS)</u>	<u>1 432</u>	<u>1 544</u>	<u>1 664</u>	<u>1 795</u>	<u>1 937</u>	<u>2 073</u>	<u>2 200</u>	<u>2 314</u>	<u>2 412</u>	<u>2 468</u>
External Revenues	719	791	870	957	1 053	1 144	1 230	1 305	1 369	1 401
Intersegment Revenues	713	753	794	838	884	929	970	1 008	1 043	1 067
<u>Automotive (AM)</u>	<u>1 997</u>	<u>2 097</u>	<u>2 202</u>	<u>2 312</u>	<u>2 428</u>	<u>2 539</u>	<u>2 643</u>	<u>2 740</u>	<u>2 828</u>	<u>2 895</u>
<u>Digital (DI)</u>	<u>1 032</u>	<u>1 099</u>	<u>1 170</u>	<u>1 246</u>	<u>1 327</u>	<u>1 404</u>	<u>1 476</u>	<u>1 541</u>	<u>1 599</u>	<u>1 636</u>
Adjustments	44	46	49	52	56	59	62	65	67	69
EBITDA Margin per segment:										
<u>Opto Semiconductors (OS)</u>	24,52%	24,77%	25,02%	25,27%	25,52%	26,00%	26,00%	26,00%	26,00%	26,00%
<u>Automotive (AM)</u>	11,69%	11,19%	10,69%	10,19%	9,69%	10,00%	10,00%	10,00%	10,00%	10,00%
<u>Digital (DI)</u>	0,92%	1,67%	2,42%	3,17%	3,92%	4,67%	5,42%	6,17%	6,92%	7,67%
Adjustments (% of Total Revenues)	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%
Capital Expenditures ⁽¹⁾	369	381	405	430	457	486	514	539	563	584
Property, Plant and Equipment	1 947	2 132	2 318	2 503	2 689	2 874	3 059	3 245	3 430	3 616
Intangible Assets	852	998	1 145	1 291	1 438	1 584	1 731	1 877	2 024	2 170

Source: Case Writer Analysis based on OSRAM Q4/FY18 Earnings Release & Strategy Update, 07/11/2018; page 43

Note: (1) Management expects Capital Expenditures to represent between 7% to 9% of revenues

Exhibit 21: OSRAM Target Financial Performance

	Revenue Growth		EBITDA Margin	
	Medium-Term	Long-Term	Medium-Term	Long-Term
Opto (OS)	~10%		23% 29%	
Automotive (AM)	3% - 7%		9% - 11%	
Digital (DI)	3% - 8%	>10%	5% - 10%	>10%

Source: Q4/FY18 Earnings Release & Strategy Update, 07/11/2018; page 43

Exhibit 22: Recent M&A deals within the Lasers and Lighting Industries (in millions of EUR)

Announcement Date	Target Name	Acquirer Name	Announced Total Value	Payment Type	TV/EBITDA
Lasers					
11/09/2018	Finisar Corp	II-VI Inc	2 327	Cash or Stock	49,34x
2/23/2016	Newport Corp	MKS Instruments Inc	1 141	Cash	16,61x
3/16/2016	Rofin-Sinar Technologies Inc	Coherent Inc	836	Cash	12,76x
10/30/2018	Electro Scientific Industries Inc	MKS Instruments Inc	801	Cash	7,02x
Lighting					
12/21/2018	iGuzzini Illuminazione SpA	Fagerhult AB	370	Cash and Stock	24,77x
4/27/2017	Lumenpulse Inc	Power Corp of Canada, Management Group	365	Cash	44,72x
03/26/18	Shenzhen Changfang Group Co Ltd	n.a.	92	n.a.	14,76x
2/14/2018	CCS Inc/Japan	Optex Group Co Ltd	70	Stock	15,05x
08/08/2017	Cyalume Technologies Holdings Inc	Arsenal Capital Partners LP	49	Cash	6,05x

Exhibit 23: Bain Capital and Advent Letter to OSRAM's Board of Directors

“[...] The Investors offer OSRAM shareholders a consideration of EUR 35.00 in cash per OSRAM share, which represents a highly attractive premium of 27.7 percent over the volume-weighted average stock exchange price in the last month prior to 3 July 2019, i.e. the day on which OSRAM published its ad-hoc announcement. The value of the proposed Offer represents a total equity value of approximately EUR 3.4 billion and a total enterprise value of approximately EUR 4.0 billion of OSRAM. This equates to a multiple of 12.5-13x based on

current adjusted EBITDA consensus forecasts of EUR 314 million for OSRAM for 2019 whereas historically, the Company has been valued with an average NTM multiple of 6-7x. In addition, the Investors are of the view that the current share price does not fully reflect the continued deterioration in OSRAM's financial performance and the uncertainty about the Company's overall future since 2018. Quite to the contrary, the Investors believe that the current share price was backed due to market speculation about a possible takeover and its significant media coverage since 2018. Based on their intense work and due diligence, the Investors are therefore convinced that the offer price of EUR 35.00 is a unique opportunity for OSRAM shareholders to realize a maximum immediate and certain value uplift for their OSRAM shares independent of the challenging outlook for the Company.

Completion of the Offer will be subject to a minimum acceptance threshold of 70 percent of all OSRAM shares and further customary conditions, including merger control and foreign investment control approvals.

Management and Supervisory Board of OSRAM fully support the Offer. [...]"

Exhibit 24: Average Debt Betas by Rating and Maturity

By Rating	A and above	BBB	BB	B	CCC
Average Beta	<0.05	0.10	0.17	0.26	0.31
By Maturity	(BBB and above)	1-5 Year	5-10 Year	10-15 Year	>15 Year
Average Beta	-	0.01	0.06	0.07	0.14

Source: S. Schaefer and I. Strebulaev, "Risk in Capital Structure Arbitrage", Stanford GSB working paper, 2009

Exhibit 25: Cost of Capital Assumptions for AMS and OSRAM

	AMS	OSRAM
Bloomberg 5-Year Equity Adjusted Beta (September/2015 - September/2019)	0,90	1,28
Effective Tax Rate	21,39%	27,63%

Source: Bloomberg and Case writer Analysis

	Switzerland	Germany
Risk Free Rate	1,10%	1,10%
Market Risk Premium	6,20%	5,70%

Source: Market Risk Premium and Risk-Free Rate Used for 69 Countries in 2019: A Survey

Exhibit 26: a) Likely Credit Rating for large non-financial manufacturing firms

Rating is	Total Debt/Capital (%)	Number of Firms
D		
C		
CC		
CCC	89,40%	23
B-		
B	74,60%	240
B+		
BB	61,30%	276
BB+		
BBB	47,40%	234
A-		

A	40,10%	150
A+		
AA	35,60%	34
AAA	26,90%	10

b) Implied Credit Rating for large non-financial manufacturing firms

EBIT Interest Coverage Ratio		Rating is	Spread is	Market Interest Rate on Debt
>	≤ to			
-100000	0,199999	D	15,00%	15,00%
0,2	0,649999	C	12,70%	12,70%
0,65	0,79999	CC	11,50%	11,50%
0,8	1,2499999	CCC	10,00%	10,00%
1,25	1,4999999	B-	8,00%	8,00%
1,5	1,7499999	B	6,50%	6,50%
1,75	1,999999	B+	4,75%	4,75%
2	2,2499999	BB	3,50%	3,50%
2,25	2,499999	BB+	2,75%	2,75%
2,5	2,99999	BBB	2,25%	2,25%
3	4,2499999	A-	2,00%	2,00%
4,25	5,499999	A	1,80%	1,80%
5,5	6,4999999	A+	1,50%	1,50%
6,5	8,49999	AA	1,00%	1,00%
8,50	100000	AAA	0,75%	0,75%

Source: Damodaran (2004)

Exhibit 27: Ranking of the top 10 packaged LED manufacturers

Ranking	2016	2017
1	Nichia	MLS
2	MLS	Nichia
3	Lumileds	Lumileds
4	Everlight	OSRAM OS
5	OSRAM OS	Everlight
6	Nationstar	240Nationstar
7	LiteOn	LiteOn
8	Hinglitrionic	Seoul Semiconductors
9	Cree	Honglitrionic
10	Seoul Semiconductors	Jufei

BIBLIOGRAPHY

2019. "AMS acquires Osram". LEDs Magazine. December 9. Accessed November 3, 2023. <https://www.ledsmagazine.com/leds-ssl-design/article/14073258/ams-acquires-osram>.
2019. "AMS volleys back in Osram bid, raising its offer". LEDs Magazine. September 27. Accessed October 29, 2023. <https://www.ledsmagazine.com/leds-ssl-design/article/14051330/ams-volleys-back-in-osram-takeover-bid-raising-its-offer>.
2019. "Osram CEO at odds with Osram as company backs ams takeover". LEDs Magazine. September 16. Accessed October 28, 2023. <https://www.ledsmagazine.com/leds-ssl-design/article/14039970/osram-ceo-at-odds-with-osram-as-company-backs-ams-takeover>.
- Allianz Global Investors. 2019. "AllianzGI comments on takeover bid for OSRAM". Allianz Global Investors. August 7. Accessed November 14, 2023. <https://www.allianzgi.com/en/press-centre/media/archive-press-releases/osram>.
- ams AG. 2018. Premstaetten: ams AG, February 26. Accessed October 15, 2023. <https://ams-osram.com/documents/20143/83420/ams+annual+report+2017+complete.pdf/d8a48782-e10b-e9e6-b1f0-7e7094351361?t=1583689226887>.
- ams AG. 2015. *ams AG Annual Report 2014*. Unterpremstätten: ams AG, January 30. Accessed October 9, 2023. https://ams-osram.com/documents/20143/82929/ams_Annual_Report_2014_Full_27042015.pdf/4001532e-7320-1521-91d9-b25ad52fba01?t=1520254242257.
- ams AG. 2016. *ams AG Annual Report 2015*. Premstätten: ams AG, February 3. Accessed October 9, 2023. https://ams-osram.com/documents/20143/83109/ams_Annual_Report_2015_Full_25042016.pdf/cce5a9a0-78e0-35c3-6de9-d86c2234c8bb?t=1520254306677.
- ams AG. 2019. *ams AG Annual Report 2018*. Premstaetten: ams AG, February 25. Accessed October 10, 2023. <https://ams-osram.com/documents/20143/83504/ams+Annual+Report+2018+complete.pdf/ec77b7b1-6f01-7fa3-253b-661f579eea81?t=1583481651703>.
- ams AG. 2020. *ams+OSRAM MOVING FORWARD ams AG Annual Report 2019*. Premstaetten, February 24. Accessed October 4, 2023. <https://ams-osram.com/documents/20143/2234347/ams+AG+Annual+Report+2019.pdf/952e1a19-4f24-9077-9438-41de6f2cc56d?t=1588100434133>.
- ams AG. 2019. *Creating a global leader in sensor solutions and photonics - Proposed acquisition of OSRAM Licht AG*. Premstätten: ams AG, September. Accessed November 5, 2023. <https://ams.com/documents/20143/2234380/ams+proposed+acquisition+of+Osram+f.pdf/b8b20a67-2259-1052-6f99-871f9cce832?t=1565585501847>.

- ams AG. 2019. *First Quarter Report 2019*. Premstaetten: ams AG, April 30. Accessed October 4, 2023. <https://ams-osram.com/documents/20143/2234347/Q1+2019+ams+report+english+f.pdf/b563125e-e928-65ea-9a7c-bda2f9b16dcd?t=1556598901207>.
- ams AG. 2019. *Half Year Report 2019*. Premstaetten, Austria: ams AG, July 23. Accessed October 10, 2023. <https://ams-osram.com/documents/20143/2234347/Q2+2019+ams+report+english+f.pdf/b9d63624-1d24-f12a-ccf8-0d0e84eae080?t=1563856181227>.
- ams AG. 2017. *Sensing is Life ams AG Annual Report 2016*. Premstaetten: ams AG, February 27. Accessed October 10, 2023. <https://ams-osram.com/documents/20143/83265/Annual+Report+ams+2016+complete+240417+f.pdf/6071e739-34ea-a506-91b9-c2f3d5c2c5fa?t=1520254342977>.
- ams AG. 2019. *Third Quarter Report 2019*. Premstaetten: ams AG, October 22. Accessed October 4, 2023. <https://ams-osram.com/documents/20143/2234347/Q3+2019+ams+report+english+f.pdf/fe48c45c-81a2-1911-46f0-e80b65b92bd9?t=1571719924487>.
- ams OSRAM. 2016. "ams acquires high end optical packaging leader Heptagon to become clear worldwide leader in optical sensing ...". ams OSRAM. October 24. Accessed October 10, 2023. <https://ams-osram.com/news/press-releases/24-10-2016-ams-acquires-high-end-optical-packaging-leader-heptagon-to-become-clear-worldwide-leader-in-optical-sensing-reports-third-quarter-results>.
- . 2017. "ams announces completion of transaction to acquire Heptagon and related capital increase". ams OSRAM. January 24. Accessed October 6, 2023. <https://ams-osram.com/news/press-releases/24-01-2017-ams-announces-completion-of-transaction-to-acquire-heptagon-and-related-capital-increase>.
- . 2016. "ams announces seasoned semiconductor executive Alexander Everke as CEO". ams OSRAM. March 01. Accessed October 4, 2023. <https://ams-osram.com/news/press-releases/ams-announces-seasoned-semiconductor-executive-alexander-everke-as-ceo>.
- . 2018. "ams laser arrays bring face recognition to Android-based smartphones". ams OSRAM. July 9. Accessed October 16, 2023. <https://ams-osram.com/news/press-releases/ams-laser-arrays-bring-face-recognition-to-android-based-smartphones>.
- . 2019. "ams launches optical sensor which measures ambient light from behind a smartphone's OLED screen". ams OSRAM. January 6. Accessed September 25, 2023. <https://ams-osram.com/news/press-releases/ams-launches-optical-sensor-which-measures-ambient-light-from-behind-a-smartphones-oled-screen>.
- . 2017. "ams signs agreement to acquire VCSEL technology leader Princeton Optronics". ams OSRAM. March 16. Accessed October 9, 2023. <https://ams-osram.com/news/press-releases/ams-signs-agreement-to-acquire-vcSEL-technology-leader-princeton-optronics>.

- . n.d. "*ams TCS3530 True Color Sensor with Flicker Detection*". ams OSRAM. Accessed October 10, 2023. <https://ams-osram.com/products/sensors/ambient-light-color-spectral-proximity-sensors/ams-tcs3530-true-color-sensor-with-flicker-detection>.
- . n.d. "*History*". ams OSRAM. Accessed September 20, 2023. <https://ams-osram.com/about-us/history>.
- . 2015. "*Investments of about €3 billion create new growth prospects for Osram*". ams OSRAM. November 10. Accessed October 16, 2023. <https://ams-osram.com/news/press-releases/pr-10-11-2015>.
- . 2015. "*Osram lays strong foundation for future growth*". ams OSRAM. November 10. Accessed October 16, 2023. Osram lays strong foundation for future growth.
- . n.d. "*Vertical-cavity surface emitting lasers (VCSEL)*". ams OSRAM. Accessed October 9, 2023. [https://ams-osram.com/technology/vcSEL#:~:text=The%20ams%20OSRAM%20VCSEL%20\(Vertical,high%20as%20150%C2%B0C](https://ams-osram.com/technology/vcSEL#:~:text=The%20ams%20OSRAM%20VCSEL%20(Vertical,high%20as%20150%C2%B0C).
- Apple Inc. 2017. "*Apple unveils X*". Youtube Video. Cupertino, California: Apple Inc., September 12. Accessed October 10, 2023. <https://www.youtube.com/watch?v=aEoVcYQ8caM>.
- . 2017. "*The future is here: iPhone X*". September 12. Accessed October 10, 2023. <https://www.apple.com/pt/newsroom/2017/09/the-future-is-here-iphone-x/>.
- Burger, Ludwig. 2018. "*Osram cuts profit guidance on weaker U.S. dollar, slow business*". Edited by David Evans. Reuters. April 24. Accessed November 10, 2023. <https://www.reuters.com/article/idUSASO0003RW/>.
- Burger, Ludwig, and Maria Sheahan. 2018. "*Osram shares drop after 'muted' first half prompts warning*". Edited by Georgina Prodhan and Keith Weir. Reuters. April 25. Accessed October 4, 2023. <https://www.reuters.com/article/idUSKBN1HW17S/>.
- . 2018. "*Osram shares drop after 'muted' first half prompts warning*". Edited by Georgina Prodhan and Keith Weir. Reuters. April 25. Accessed November 12, 2023. <https://www.reuters.com/article/idUSL8N1S21ZH/>.
- Carlyle. 2019. "*Bain Capital Private Equity and The Carlyle Group announce intention to launch voluntary public takeover offer for OSRAM*". ams OSRAM. July 4. Accessed November 14, 2023. <https://www.carlyle.com/media-room/news-release-archive/bain-capital-private-equity-and-carlyle-group-announce-intention>.
- CBI Ministry of Foreign Affairs. 2014. "Electronic Lighting in the Netherlands."
- Center of Industrial Studies. 2019. "World trade of lighting." *Center of Industrial Studies*.
- Counterpoint Research. 2019. "*Global Smartphone Market Declines for The First Time in CY 2018*". Counterpoint Research. February 1. Accessed October 10, 2023. <https://www.counterpointresearch.com/insights/global-smartphone-market-declines-first-time-cy-2018/#:~:text=According%20to%20the%20latest%20research,consecutive%20quarter%20of%20smartphone%20decline>.

- Cremer, Andreas. 2014. "Germany's Osram appoints new CEO from January 2015". Edited by David Evans. Reuters. November 5. Accessed October 4, 2023. <https://www.reuters.com/article/idUSFWN0SV04B20141105/>.
- . 2015. "New Osram CEO has no plans for further job cuts: paper". Edited by Mark Potter. Reuters. February 25. Accessed October 11, 2023. <https://www.reuters.com/article/idUSKBN0LT20D20150225>.
- Cremer, Andreas, and Georgina Prodhon. 2017. "Osram targets further profit, sales growth in 2018". Edited by David Evans. Reuters. November 6. Accessed November 5, 2023. <https://www.reuters.com/article/idUSL5N1NC3HM/>.
- Cremer, Andreas, and Maria Sheahan. 2014. "Osram shares gain as new CEO named, restructuring takes hold". Edited by David Evans and Victoria Bryan. Reuters. November 6. Accessed October 7, 2023. <https://www.reuters.com/article/idUSL6N0SW2TF20141106/>.
- David, Ruth, Sarah Syed, and Dinesh Nair. 2018. "Bain Said to Explore Takeover Bid for Germany's Osram Licht". Bloomberg. November 27. Accessed November 14, 2023. <https://www.bloomberg.com/news/articles/2018-11-27/bain-said-to-be-exploring-takeover-bid-for-germany-s-osram-licht?leadSource=uverify%20wall>.
- Deutsch, Anthony, and Thomas Escritt. 2014. "Breaking with tradition, Philips splits off lighting". Edited by David Clarke. Reuters. September 23. Accessed October 4, 2023. <https://www.reuters.com/article/idUSL6N0RO0R420140923/>.
- Deutsche Börse Group. 2019. "Unscheduled free-float adjustment of Osram Licht AG in MDAX". Deutsche Börse Group. October 10. Accessed November 30, 2023. <https://www.deutsche-boerse.com/dbg-en/media/press-releases/Unscheduled-free-float-adjustment-of-Osram-Licht-AG-in-MDAX-1643150>.
- Eccles, Robbert G., Kersten L. Lanes, and Thomas C. Wilson. 1999. "Are You Paying Too Much for That Acquisition?". Harvard Business Review. Accessed December 1, 2023. <https://hbr.org/1999/07/are-you-paying-too-much-for-that-acquisition>.
- Fortune Business Inside. 2020. *Lighting Market Size, Share & COVID-19 Impact Analysis, by Lighting Type , by Application, by End User and Regional Forecasts, 2020-2027*. Fortune Business Inside.
- Gruber, Harald. 2000. "THE SEMICONDUCTOR INDUSTRY: REVIEW OF THE SECTOR AND FINANCING OPPORTUNITIES."
- Hack, Jens, and Christoph Steitz. 2015. "Osram exec defends new strategy, says change is needed". Edited by Louise Heavens. Reuters. December 8. Accessed October 25, 2023. <https://www.reuters.com/article/idUSL8N13X0WX20151208/>.
- Hack, Jens, Caroline Copley, and Georgina Prodhon. 2016. "Osram's CEO clashes with Siemens over LED strategy". Edited by Greg Mahlich and Keith Weir. Reuters. February 16. Accessed October 21, 2023. <https://www.reuters.com/article/idUSKCN0VP1MX/>.

- Halper, Mark. 2019. *"AMS falls short in bid to acquire Osram, for now"*. October 2. Accessed November 2, 2023. <https://www.ledsmagazine.com/leds-ssl-design/article/14067857/ams-falls-short-in-bid-to-acquire-osram-for-now>.
- . 2019. *"AMS pushes on, making a more lenient offer for Osram"*. LEDs Magazine. October 22. Accessed November 2, 2023. <https://www.ledsmagazine.com/leds-ssl-design/article/14069089/ams-pushes-on-making-a-more-lenient-offer-for-osram>.
- . 2019. *"AMS takes its Osram acquisition to shareholders"*. LEDs Magazine. September 4. Accessed October 28, 2023. <https://www.ledsmagazine.com/leds-ssl-design/article/14039222/ams-takes-its-osram-acquisition-to-shareholders>.
- . 2017. *"As lighting companies move to IoT services, everything in the business model must change"*. LEDs Magazine. June 1. Accessed October 20, 2023. <https://www.ledsmagazine.com/connected-ssl-controls/article/16700637/as-lighting-companies-move-to-iot-services-everything-in-the-business-model-must-change>.
- . 2019. *"Austrian sensor company ams is interested in Osram after all"*. LEDs Magazine. July 25. Accessed October 25, 2023. <https://www.ledsmagazine.com/smart-lighting-iot/indoor-networks-controls/article/14036932/austrian-sensor-company-ams-is-interested-in-osram-after-all>.
- . 2019. *"Bain jockeys to raise its offer for Osram"*. LEDs Magazine. September 25. Accessed November 2, 2023. <https://www.ledsmagazine.com/leds-ssl-design/article/14040642/bain-jockeys-to-raise-its-offer-for-osram>.
- . 2018. *"Buyout specialists eyeing Osram"*. LEDs Magazine. December 3. Accessed October 21, 2023. <https://www.ledsmagazine.com/leds-ssl-design/networks-controls/article/16701643/buyout-specialists-eyeing-osram>.
- . 2019. *"Osram confirms it's in talks to be acquired, and overhauls an IoT segment"*. LEDs Magazine. February 14. Accessed October 23, 2023. <https://www.ledsmagazine.com/leds-ssl-design/modular-light-engines/article/16699104/osram-confirms-its-in-talks-to-be-acquired-and-overhauls-an-iot-segment>.
- . 2019. *"Osram endorses latest ams takeover offer as 2019 losses mount"*. LEDs Magazine. November 12. Accessed November 3, 2023. <https://www.ledsmagazine.com/leds-ssl-design/article/14071805/osram-endorses-latest-ams-takeover-offer-as-2019-losses-mount>.
- . 2019. *"Osram reports €91M loss in second quarter"*. May 8. Accessed October 22, 2023. <https://www.ledsmagazine.com/leds-ssl-design/networks-controls/article/16699097/osram-reports-91m-loss-in-second-quarter>.
- . 2019. *"Osram's quarter dives, orders could pick up in second half (UPDATED)"*. LEDs Magazines. February 8. Accessed October 22, 2023. <https://www.ledsmagazine.com/leds-ssl-design/modular-light-engines/article/16699116/osrams-quarter-dives-orders-could-pick-up-in-second-half-updated>.

- . 2019. "Q3 losses mount at Osram as September takeover deadline approaches". LEDs Magazine. July 31. Accessed October 26, 2023. <https://www.ledsmagazine.com/specialty-ssl/article/14037360/q3-losses-mount-at-osram-as-september-takeover-deadline-approaches>.
- . 2019. "Sensor company flirted with Osram takeover". LEDs Magazine. July 19. Accessed October 24, 2023. <https://www.ledsmagazine.com/smart-lighting-iot/indoor-networks-controls/article/14036484/sensor-company-ams-flirted-with-osram-takeover>.
- . 2019. "Takeover bid for Osram hits stiff resistance". August 12. Accessed October 28, 2023. <https://www.ledsmagazine.com/specialty-ssl/article/14038165/takeover-bid-for-osram-hits-stiff-resistance>.
- . 2019. LEDs Magazine. August 12. Accessed October 28, 2023. <https://www.ledsmagazine.com/specialty-ssl/article/14038199/austrian-sensor-company-swoops-in-with-offer-to-buy-osram>.
- Hekper, Mark. 2019. "Osram unloads Siteco, but the bigger corporate sale could be stalling". LEDs Magazines. June 2019. Accessed October 24, 2023. <https://www.ledsmagazine.com/architectural-lighting/indoor-lighting/article/14035508/osram-unloads-siteco-but-the-bigger-corporate-sale-could-be-stalling>.
- Hodgson, Camilla. 2018. "Apple supplier AMS in steepest fall since 2008". Financial Times. October 23. Accessed September 25, 2023. <https://www.ft.com/content/930e89f4-d692-11e8-a854-33d6f82e62f8>.
- Kharpal, Arjun. 2018. "Apple's iPhone X will be killed off this year, analyst says". CNBC. April 20. Accessed October 12, 2023. <https://www.cnbc.com/2018/04/20/apple-iphone-x-discontinued-this-year-analyst-says.html#:~:text=Apple's%20iPhone%20X%20is%20likely,components%20for%20the%20iPhone%20X>.
- Kim, Tae. 2018. "Analysts worry Apple iPhone sales are even worse than they thought". CNBC. April 2018. Accessed October 16, 2023. <https://www.cnbc.com/2018/04/19/analysts-worry-apple-iphone-sales-are-even-worse-than-they-thought.html>.
- Kirchfeld, Aaron, Dinesh Nair, and Ruth David. 2019. "Bain, Carlyle Are Weighing a Joint Bid for Germany's Osram". Bloomberg. February 13. Accessed October 22, 2023. <https://www.bloomberg.com/news/articles/2019-02-13/bain-carlyle-are-said-to-weigh-joint-bid-for-germany-s-osram-js33xaft>.
- LEDs Magazine. 2013. *Osram shares begin trading on the Frankfurt and Munich Stock Exchanges*. LEDs Magazine. July 9. Accessed October 20, 2023. <https://www.ledsmagazine.com/home/article/16697260/osram-shares-begin-trading-on-the-frankfurt-and-munich-stock-exchanges>.
- Li, Lault, Cheng Ting-Fang, and Kensaku Ihara. 2018. "Apple warns suppliers of 20% drop in new iPhone parts orders". NIKKEI Asia. June 8. Accessed October 12, 2023.

- <https://asia.nikkei.com/Business/Companies/Apple-warns-suppliers-of-20-drop-in-new-iPhone-parts-orders>.
- Markets and Markets,. 2017. *LED Lighting Market by Installation Type (New Installation and Retrofit Installation), End-Use Application (Indoor Lighting and Outdoor Lighting), Product Type (Lamps and Luminaires), and Geography - Global Forecast to 2022*. Markets and Markets.
- McGee, Patrick, and Javier Espinoza. 2018. "Bain Capital eyes taking German lighting group Osram private". Financial Times. November 27. Accessed November 14, 2023. <https://www.ft.com/content/dba3f048-f274-11e8-9623-d7f9881e729f>.
- Megaw, Nicholas. 2018. "AMS revenues climb 252% as iPhone success boosts Apple suppliers". Financial Times. January 29. Accessed October 10, 2023. <https://www.ft.com/content/569fc3b8-04cc-11e8-9650-9c0ad2d7c5b5>.
- Millward, Steven. 2019. "Xiaomi sold record 119 million smartphones despite market decline". TECHINASIA. March 20. Accessed October 16, 2023. <https://www.techinasia.com/xiaomi-record-phone-sales-2018>.
- Murphy, Francois. 2019. "Apple supplier AMS develops behind-screen optical sensor for phones". Edited by Mark Potter. Reuters. January 7. Accessed September 25, 2023. <https://www.reuters.com/article/us-ams-sensor/apple-supplier-ams-develops-behind-screen-optical-sensor-for-phones-idUSKCN1P11SW/>.
- OSRAM Licht AG. 2017. *Annual Report of OSRAM Licht Group Fiscal Year 2017*. Munich: OSRAM Licht AG, November 30. Accessed October 17, 2023. https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram_2017.pdf.
- OSRAM Licht AG. 2018. *Annual Report of OSRAM Licht Group Fiscal Year 2018*. Munich: Osram Licht AG, December 5. Accessed October 17, 2023. https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram_2018.pdf.
- OSRAM Licht AG. 2019. *Annual Report of OSRAM Licht Group Fiscal Year 2019*. Munich, December 6. Accessed October 20, 2023. https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram_2019.pdf.
- OSRAM Licht AG. 2019. *Interim Report of OSRAM Licht Group for the First Half Year of Fiscal Year 2019*. Munich: OSRAM Licht AG, May 10. Accessed November 17, 2023. <https://ircenter.handelsblatt.com/download/companies/osram/Quarterly%20Reports/D E000LED4000-Q2-2018-EQ-E-00.pdf>.
- OSRAM Licht AG. 2014. *Light Moves Annual Report and Yearbook of OSRAM Licht Group for Fiscal 2014*. Munich: OSRAM Licht AG, December 4. Accessed October 20, 2023. https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram_2014.pdf.
- OSRAM Licht AG. 2015. *Light Moves Annual Report of OSRAM Licht Group For Fiscal 2015*. Munich: OSRAM Licht AG, December 7. Accessed October 20, 2023. https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram_2015.pdf.

- OSRAM Licht AG. 2019. *Market environments shape the first quarter of FY19*. Munich: OSRAM Licht AG, February 7. Accessed November 17, 2023.
<https://ircenter.handelsblatt.com/download/companies/osram/Quarterly%20Reports/DE000LED4000-Q1-2018-EQ-E-00.pdf>.
- OSRAM Licht AG. 2018. *Q4/FY18 Earnings Release & Strategy Update*. Munich: OSRAM Licht AG, November 7. Accessed November 15, 2023.
https://static.seekingalpha.com/uploads/sa_presentations/909/35909/original.pdf.
- OSRAM Licht AG. 2016. *Reinventing Light for 110 Years Annual Report of OSRAM Licht Group Fiscal Year 2016*. Munich: OSRAM Licht AG, December 5. Accessed October 17, 2023.
https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram_2016.pdf.
- Prodhan, Georgina. 2016. "Osram CEO believes big shareholders will back strategy". Edited by Keith Weir and Mark Potter. Reuters. January 21. Accessed October 25, 2023.
<https://www.reuters.com/article/idUSL8N1553IO/>.
- . 2017. "Osram CEO says strategy on track as automotive lifts Q1". Edited by Harro ten Wolde and Edwina Gibbs. Reuters. February 8. Accessed November 3, 2023.
<https://www.reuters.com/article/idUSL5N1FT0O9/>.
- . 2016. "Osram raises forecast after strong second quarter". Edited by Louise Heavens. Reuters. April 18. Accessed October 30, 2023.
<https://www.reuters.com/article/idUSL5N17L3R0/>.
- . 2015. "Osram says lamps carve-out will take 12 months". Edited by Maria Sheahan. Reuters. April 29. Accessed October 12, 2023.
<https://www.reuters.com/article/idUSV9N0N100Q20150429>.
- . 2017. "Osram says too early to decide on phase two of Malaysia chip plant". Edited by Arno Schuetze. Reuters. February 7. Accessed November 4, 2023.
<https://www.reuters.com/article/idUSL5N1FT4D6/>.
- . 2015. "Osram to invest in growth again, buy back shares". Edited by Susan Thomas. Reuters. November 10. Accessed October 20, 2023.
<https://www.reuters.com/article/idUSL8N13555U20151110>.
- . 2015. "Osram's new growth strategy hits shares". Edited by Maria Sheahan and David Clarke. Reuters. November 11. Accessed October 20, 2023.
<https://www.reuters.com/article/idUSL8N1361I320151111/>.
- Prodhan, Georgina, and Jens Hack. 2015. "Osram starts sales process for lamps business". Edited by Christoph Steitz. Reuters. November 6. Accessed October 17, 2023.
<https://www.reuters.com/article/idUSFWN13103Y20151106/>.
- Prodhan, Georgina, and Victoria Bryan. 2015. "Osram raises profit outlook after strong quarter". Edited by Jane Merriman. Reuters. April 16. Accessed October 15, 2023.
<https://www.reuters.com/article/idUSL5N0XD4RZ20150416/>.

- Qontigo. 2019. *"Unscheduled free-float adjustment of OSRAM Licht AG in MDAX"*. Qontigo. December 10. Accessed November 30, 2023. <https://qontigo.com/unscheduled-free-float-adjustment-of-osram-licht-ag-in-mdax-2/>.
- Reuters. 2016. *"Ams Q3 revenues at 146.7 mln euros, signs agreement to acquire Heptagon"*. Reuters. October 25. Accessed October 2023, 6. <https://www.reuters.com/article/idUSL8N1CV000/>.
- Rocco, Matthew. 2018. *"Analysts cut Apple iPhone sales forecasts on supplier woes"*. Financial Times. November 13. Accessed October 12, 2023. <https://www.ft.com/content/9aafffe6-e761-11e8-8a85-04b8afea6ea3>.
- Sachgau, Oliver. 2019. *"Osram Feeds Union Anger After Backing \$4.1 Billion AMS Offe"*. Bloomberg. September 2019. Accessed November 14, 2023. <https://www.bloomberg.com/news/articles/2019-09-16/osram-rejects-ams-s-4-1-billion-bid-sticking-with-bain-carlyle>.
- Samson, Adam. 2018. *"Chipmaker AMS slumps 9% after outlook comes in far below expectations"*. Financial Times. April 24. Accessed October 12, 2023. <https://www.ft.com/content/69f7bf46-478f-11e8-8ee8-cae73aab7ccb>.
- Schuetze, Arno. 2018. *"Osram to buy back more shares, keep dividend stable despite earnings drop"*. Edited by Adrian Croft and David Goodman. Reuters. November 6. Accessed November 12, 2023. <https://www.reuters.com/article/idUSKCN1NB2EZ/>.
- Schuetze, Arno, Alexander Hübner, and Kathrin Jones. 2019. *"Osram to consider \$3.8 billion takeover bid from Bain, Carlyle"*. Edited by Douglas Busvine and Elaine Hardcastle. Reuters. July 3. Accessed October 23, 2023. <https://www.reuters.com/article/us-osram-m-a-bain-capital-carlyle-group/osram-to-consider-38-billion-takeover-bid-from-bain-carlyle-idUSKCN1TY20I>.
- Schuetze, Arno, Georgina Prodhan, and Deena Yao. 2015. *"Osram in talks with potential buyers of lamps business -sources"*. Edited by Ludwig Burger and David Goodman. Reuters. June 30. Accessed October 20, 2023. <https://www.reuters.com/article/idUSL8N0ZG47R20150630/>.
- Sheahan, Maria. 2017. *"Osram raises 2017 guidance after strong Q2, shares climb"*. Edited by Harro ten Wolde and Edmund Blair. Reuters. May 2. Accessed November 3, 2023. <https://www.reuters.com/article/idUSL8N1I457G/>.
- . 2016. *"Osram sells lamps unit to Chinese buyers for more than 400 mln eur"*. Edited by Harro ten Wolde. Reuters. July 26. Accessed November 2, 2023. <https://www.reuters.com/article/osram-licht-ma-china-idUSF9N19T010/#:~:text=Osram%20sells%20lamps%20unit%20to%20Chinese%20buyers%20for,for%20more%20than%20400%20million%20euros%20%28%24439.3%20million%29>.
- . 2018. *"Osram slashes guidance as autos customers push back orders"*. Edited by Christoph Steitz and Alexandra Hudson. Reuters. June 28. Accessed November 12, 2023. <https://www.reuters.com/article/idUSL8N1TU4SB>.

- Sheahan, Maria, and Irene Preisinger. 2018. "*Osram warns of threat to guidance from weaker U.S. dollar*". Edited by Subhranshu Sahu and Keith Weir. Reuters. February 7. Accessed November 5, 2023. <https://www.reuters.com/article/idUSL8N1PX0X4/>.
- Smith, Elliot. 2019. "*Apple supplier AMS surges 20% as it diversifies to Android phones*". CNBC. April 30. Accessed September 25, 2019. <https://www.cnbc.com/2019/04/30/apple-supplier-ams-surges-20percent-as-it-diversifies-to-android-phones.html#:~:text=AMS%20is%20known%20as%20the,suspend%20dividend%20payments%20in%20February.>
- Sterling, Toby. 2016. "*Philips, Osram lighting spin-offs diverge on LED challenge*". Edited by Sonya Hepinstall. Reuters. May 10. Accessed November 2, 2023. <https://www.reuters.com/article/idUSL5N1830KF>.
- Technavion . 2019. "Top 10 Largest LED Lighting Manufacturers in the World 2019."
- Venzon, Cliff. 2018. "*Apple moves lower after report of fewer orders*". Financial Times. June 8. Accessed October 12, 2023. <https://www.ft.com/content/153a6bf0-6b36-11e8-8cf3-0c230fa67aec>.
- Voestalpine. n.d. "*Our history*". Voestalpine. Accessed September 20, 2023. <https://www.voestalpine.com/group/en/group/overview/history/>.
- Wagner, I. 2019. *Global LED lighting market size from 2019-2023*. Statista.
- White, Edward. 2019. "*Apple chipmaker TSMC sees slower growth ahead*". Financial Times. January 17. Accessed October 12, 2023. <https://www.ft.com/content/49cb2a8e-1a05-11e9-9e64-d150b3105d21>.
- Zissis, G., Bertoldi, P., Serrenho, T. 2021. "Update on the Status of LED-Lighting world market since 2018."

INDIVIDUAL PART

Case Synopsis

AMS, an Austrian semiconductor-focused producer, under the leadership of CEO Alexander Everke, finds itself in the throes of a high-profile acquisition bid for OSRAM, a lighting company, versus the private equity (PE) fund Bain Capital. The deal is inserted in the rich lighting and semiconductor industries' history, which has, for long, been shaped, not only by pioneering inventions, but also by strategic mergers, acquisitions, and restructurings.

The story unfolds with AMS's CEO, facing a pivotal moment in September 2019, when the firm fails to secure the 62.5% equity stake minimum threshold in the public markets for the takeover to be successful. Everke now faces a crucial decision: whether to escalate the bid in the takeover attempt or maintain its offer, balancing growth prospects against excessive financial leverage and shareholder interests.

The CEO and the board must consider various factors in their decision-making: integrating different corporate cultures, responding to market fluctuations, and maintaining stock price stability, all while trying to gain the support of a skeptical workforce. The case study follows AMS as it navigates these challenges, reassessing its financial approach in light of a possible counteroffer from a new Private Equity consortium composed by Bain Capital and Advent Capital, and aligning its actions with the company's long-term goals.

The case study encapsulates the multifaceted aspects of M&A, highlighting the interplay of leadership, strategic planning, and corporate decision-making in high-stakes environments.

Learning Objectives

- *Assessing the recent financial performance of a company;*
- *Conducting a valuation of a company using different valuation methodologies;*
- *Conducting a valuation of proposed synergies during a merger process and understanding how it impacts the price to be paid for a target;*

- Understanding the different perspectives that managers need to consider when deciding whether to acquire a company, besides the financial valuation.

Target Audience

This case and its assigned questions are suitable for Masters' or MBA students who are pursuing a degree related to business, management, or finance within courses such as Mergers and Acquisitions (M&A), Corporate Finance and Corporate Valuation. The students should have a basic knowledge of Corporate Finance, namely related to different valuation methodologies and cost of capital calculation for different types of cashflows.

Teaching Plan

This case should be taught during a session of at least 90 minutes. Prior to the session, students should be encouraged to read the entire case and prepare themselves accordingly by answering the proposed Assignment Questions. Given that the case study is grounded in real events, students are encouraged to investigate the companies further and circumstances to foster a more hands-on learning experience. The questions posed in the assignment are designed to provoke student engagement with critical thought and to assess the compromises inherent in real-world management choices. It is advisable to promote discussions within the classroom setting.

Within the opening 20 minutes, the case should be summarized, with the key findings being discussed by the students. Then, the instructor should display the Assignment Questions to motivate the discussion going forward. The following 60 minutes should be allocated to assessing the recent financial performance of both companies followed by a strategic and quantitative analysis of the deal. Finally, the instructor should devote the final 15 minutes of the session to let the students put themselves in the shoes of AMS's Executive Board members and vote on a final decision, deciding whether the company should increase or not the bid, concluding by presenting the key learnings and what happened in reality.

Assignment Questions

1. What main reasons are propelling AMS to acquire OSRAM? How do these vary to the ones of Bain Capital and Advent? Is there a convincing rationale for the acquisition?
2. What is the value of OSRAM cash flows on a stand-alone basis, based on OSRAM's long-term projections in **Exhibit 21**? Please assume a valuation date of 30/09/2019 and year-end cashflows with the fiscal year starting in 01/10 and ending in 30/09 of the following year.
3. What is the present value of the projected merger synergies in **Exhibit 18** as of 30/09/2019?
4. Based on your valuation of the target and the strategic analysis conducted to the deal, would you recommend the Board to raise the bid and pursue the acquisition? What is the range of acceptable values for OSRAM if: a) none of the projected synergies are expected to be realized; b) 100% of the projected synergies are expected to be realized.

Analysis

Question 1) Both AMS and Bain Capital had, in its essence, the same main reason for acquiring OSRAM, which was related to the target's recent own decline, prior to the bidding war. In 2014, OSRAM began shifting from its traditional lighting business to the advanced photonics market, which then accounted for about 43% of total revenues. (**Appendix 1**) Despite OSRAM's ambitious strategy, the company encountered a downtrend in operational profits, particularly in 2019 when it reported negative profits. (**Exhibit 2**) The 2014 announcement of OSRAM's restructuring initiative, led to a 25% drop in its shares, with investors sceptical about its success. This decline continued from late 2018 through 2019, mirroring OSRAM's deteriorating performance. (**Exhibit 9**)

Zook (2004) highlights a crucial challenge facing contemporary businesses: identifying sustainable and profitable growth avenues. Investing in markets adjacent to a company's core

business emerges as a successful strategy, yet it demands meticulous analysis and strategic planning. OSRAM's strategic shift is an example of this, aiming to counter the decline in its traditional lighting sector by focusing on growing its opto-semiconductors and digital segments. This represents a "New Business" adjacency strategy, where a firm develops a new business based on a core competency, a move that is both rare and complex.

In Zook (2004)'s study, mentioned above, implementing strategic shifts like the one OSRAM pursued is a challenging endeavor, with success in these efforts being predominantly driven by improved financial performance and a more advantageous market position. However, due to the inherent risks and complexities involved, akin to OSRAM's chosen path, a vast majority of companies fail in such transformations. Although initial bringing positive results due to a surge in the LED market that impacted positively the automotive and semiconductor segments, OSRAM's strategic shift success was temporarily, as escalating R&D and CAPEX costs, unfavorable euro-dollar currency fluctuations (with 50% of OSRAM's revenues being dollar-denominated), and the 2018/2019's downturn in the automotive market led to a rapid decline. Strategic buyers focus on acquiring target firms to create synergies, often integrating them with their existing operations. Post-acquisition, they may operate the target as an independent subsidiary or integrate it fully or partially into the parent company, with the latter approach aimed at quickly realizing synergies. (DePamphilis, 2019) As such, AMS can be classified as a strategic buyer, given the synergies expected to be created. According to AMS' management, the deal was expected to generate €300 million in annual synergies, in the medium term, following the deal's closure, as detailed in Exhibit 18, and analyzed in detail in Question 3).

AMS' growth strategy through M&A aligns with the broader principle that growth is an essential aspect of management strategy. Growth is a necessary component of corporate strategy but can be challenging to achieve. (Gaughan, 2013) Companies often must choose between organic growth and growth through M&A, and the decision is influenced by the rate of market

change and competitive pressures. For AMS, the rapidly changing semiconductor and sensor markets necessitated a more aggressive growth strategy, for which M&A was a suitable path. Since 2014, AMS's recent M&A strategy has been characterized by the integration of technology-driven entities, like Heptagon in 2016, Princeton Optics in 2017, and KeyLemon in 2018 (Exhibit 3), distinguished by their substantial commitments to R&D and innovation, endowing them with unique and valuable capabilities. Thus, it seems that this strategy has been guided by the understanding that firms can learn from their prior M&A experiences (Hayward, 2002; Zollo and Singh, 2004), with this learning curve proving to be more effective when the acquired companies are like previous acquisitions (Hitt et al. ,2001). This approach aligns with AMS strategy, given that all these targets were of smaller scale compared to AMS itself. However, the proposed acquisition of OSRAM represents a deviation from this established pattern. While aligning with AMS's ongoing strategy of assimilating technologically sophisticated companies with heavy R&D investments, the OSRAM deal is distinct due to its relative magnitude. OSRAM's size, being three times larger than AMS, introduces a new dimension of complexity, potentially leading to significant integration challenges. (Kusewitt Jr. 1985) This is a significant shift for AMS, as any of the acquired target entities has surpassed its own size, potentially intensifying the challenges resulting from the integration process. The theoretical approach to business growth suggests that moving into adjacent businesses is a key strategy for sustainable growth. (Durmaz and Ilhan, 2015) AMS's acquisition of OSRAM was a strategic move to diversify and strengthen its business. This was particularly crucial given AMS's heavy reliance on Apple, which accounted for 40 to 45% of its revenue. The significant risk of this dependency was evident in 2018, when reduced demand for the iPhone X led to a sharp decline in AMS's profitability and a 74% drop in share price. (**Exhibit 4**) With the acquisition, AMS aimed, now, to expand into the Automotive segment, where OSRAM was

already the market leader, in a move designed to reduce AMS's over-reliance on the Consumer segment and create a more diverse and robust business portfolio. (*Exhibit 16*)

Furthermore, Zook (2004) also finds the success of sustainable growth and acquisitions to rely on a clear definition of what the core business of the company is. In AMS's case, after the acquisition of OSRAM, they had a clear idea that the company was going to shift focus to *"creating a global leader in sensor solutions and photonics"*. Strategic divestitures are one of the methods used by companies to refocus on core competencies, generate capital, unlock value in non-core units, and meet antitrust requirements in industries with limited competition, realign resources towards key offerings, particularly in competitive markets, and reinvest in higher-return areas. (Joy 2018) Thus, the planned divestiture of OSRAM's Digital business, was in line with focusing on core strengths in sensing and photonics. Divesting the Digital business, which concentrated on IoT-integrated lighting solutions and diverged from AMS's primary competencies, would help AMS consolidate its resources and enhance its position in its core markets. The capital from this sale could be used to pursue additional investment opportunities in the sensing and photonics industries, further increasing the clear focus of the future company. Lastly, acquiring firms often pay a premium over the market value (Hogarty 1970), which was evident in AMS's bid for OSRAM, where a substantial premium was offered due to the synergies expected to be realized. The success of such strategies relies both on the accurate valuation of the target (discussed in Question 2) and synergies (discussed in Question 3).

On the opposite side of the table, financial buyers have a significantly different approach to acquisitions, typically using a significant amount of debt to enhance financial returns and focus on enhancing the target firm's cash flows through improved management practices to sell it at a higher price within a short to medium period. Their approach often includes short-term strategies like cost-cutting and personnel reductions to quickly increase profitability and value. Interestingly, however, OSRAM's employees' unions and representatives announced a

preference for an acquisition by Bain Capital, despite the common use of such strategies by PE firms. This stance likely arises from apprehensions that an AMS-led takeover could lead to significant job losses, possibly connected to AMS's plan to divest OSRAM's digital business line. Moreover, while AMS has communicated its intention to create more jobs in Germany than it would eliminate, the company had not definitively excluded the possibility of mandatory layoffs. On the other hand, the PE investors did not intend to change OSRAM's business model. Additionally, rather than managing the business directly, financial investors typically monitor the existing management team's effectiveness, intervening only when there is a significant deviation from expected performance. (DePamphilis, 2019) The PE consortium, unlike AMS, intended to retain OSRAM's current business model, supporting its shift from a traditional lighting company to one focused on IoT-integrated lighting solutions. OSRAM's CEO valued the consortium's experience in technology and industrial investments, believing it could significantly aid OSRAM's strategic transformation. The consortium proposed taking OSRAM private, reasoning that this would enable a more effective transition away from public market pressures and investor skepticism, thus allowing a more concentrated and steadier strategic shift without the distraction of fluctuating stock prices and short-term market concerns.

Both AMS and the PE consortium presented compelling reasons for acquiring OSRAM. For AMS, the acquisition represented an opportunity to achieve rapid growth within the fiercely competitive semiconductor industry, enabling to diversify its revenue streams, transitioning away from the reliance on the Consumer segment towards a more balanced revenue mix, by leveraging OSRAM's leadership in the automotive sector. Additionally, AMS's management was confident about the generation of significant synergies, thereby justifying the premium to be paid. Conversely, the PE acquirers aimed to acquire OSRAM at an attractive valuation, having the goal to guide OSRAM's transformation into a technology-focused company while shielded from the short-term pressures of financial markets by taking it private.

Question 2) To determine the appropriate acquisition price for OSRAM, it is essential to ascertain the company's standalone value, assuming it remains independent, without external integration. This entails a valuation analysis utilizing prevalent valuation methodologies, being the Discounted Cash Flow (DCF) analysis, Comparable Companies' Analysis (CCA) and Precedent Transactions Analysis (PTA) the most common ones. (Rosenbaum and Pearl 2009)

Firstly, it is important to highlight that OSRAM restructured its business segment reporting in 2019, as indicated in its mid-year report. Consequently, and given the lack of available information, the revenue distribution for prior years was recalculated under the assumption that the AM business segment's contribution to total revenues in the first half of 2018 (53.14%) remained constant in earlier years. The OS segment remains unchanged, not requiring additional assumptions. Revenue for the DI business segment was computed as the residual figure after accounting for the other segments' contributions to total revenues. (*Exhibit 2*)

OSRAM's revenue and EBITDA projections by business segment, as detailed in *Exhibit 21*, were primarily based on management expectations for the medium to long-term, outlined in the company's Strategy Update, published in November 2018 (Exhibit 20) and also made available by AMS in September 2019 when OSRAM's acquisition was presented to investors. To address the sensitivity of the DCF analysis to varying assumptions and reduce management bias, the analysis includes three scenarios: the worst scenario (the most pessimistic management view), the best scenario (the most optimistic management view) and a balanced base scenario, calculated as the average of the two. The projections made available in *Exhibit 21*, consider the base scenario. Most of the projections made using historical data focus on the period from 2015 to 2018 because these years provide full-year figures, unlike 2019, and because they come after the start of the restructuring period within the company, which began in 2014.

The revenue forecast for OSRAM was based on growth rates per segment instead of specific metrics like average price per unit or the number of units sold, given the limited information available and to better understand differences between segments. (**Appendix 2**)

Given the new segment reporting introduced in 2019, conducting a detailed historical EBITDA analysis for each business segment proved to be unfeasible. Furthermore, using additional assumptions to analyze historical trends could overcomplicate the analysis and potential lead to errors. Therefore, EBITDA margin evolution assumptions were also based on management forecasts for the three scenarios as detailed in **Appendix 3**.

Depreciation and Amortization (D&A) and CAPEX projections were based on historical trends, and forecasted to be 6.54% and 8.44% of revenues, respectively, for the base scenario. The best scenario assumes 6.95% and 9.00% of revenues, respectively, and the worst scenario 4.85% and 7.00% of revenues, respectively. (**Appendix 4**) CAPEX projections align with management's target of 7% to 9% of revenues, as outlined in the previous Strategy Update. Net Working Capital (NWC) assumptions and projections are detailed in **Appendix 5**.

The analysis considers an effective tax rate of 27.63% for the three scenarios, reflecting the historical average from 2015 to 2018. Given OSRAM's location in Germany, a politically stable country with a relatively consistent corporate tax rate ranging from 30.1% to 30.4% during the previous 5 years, significant fluctuations in future tax rates were not anticipated. (**Appendix 6**)

Considering the assumptions outlined above and using the formula, the projected Free Cashflows (FCF) for the company are detailed in Appendices 7,8 and 9. As a result, the DCF calculated an Enterprise Value of €4,006 million, assuming a Terminal Value of €2,823 million and a Weighted Average Cost of Capital (WACC) of 5.77%. Considering the Net Debt of €424 million as of 30/09/2019, the Equity Value is €3,582 million, €37.08/share for the base case (**Appendix 10**). Assuming the optimistic scenario, the share price increases to €58.40 (**Appendix**

11) while the pessimistic scenario depreciates the share price to €27.39 (Appendix 12). This results in a price span from €23.39/share to €58.40/share.

The Terminal Value Growth Rate (g) was assumed to be 2.34% per year in the base scenario, calculated as the weighted average estimated growth rate per region were OSRAM's sells its products and the average contribution of each region to total revenues between 2015 and 2018. (Appendix 13) In the optimistic scenario, a more aggressive growth rate of 3% is assumed, in line with the long-term expected growth rate of the Asia-Pacific Region (APAC), while the pessimistic scenario is more conservative, assuming a perpetual growth rate of 0%.

The WACC has been calculated at 5.77%, based on a target Debt/Value ratio (D/V) of 23.6%. Despite historical data suggesting a very low D/V (an average of 2% between 2015 and 2018), the D/V of selected peers is considerably higher, around 40%. Thus, it was assumed an increase of the leverage ratio of the company. However, in OSRAM's 2018 Annual Report, management highlighted the company had a "*strong capital structure with leverage potential*" but there was a "*need for prudence*" given that OSRAM was "*targeting Investment Grade*". Therefore, it was assumed that the company would target a credit rating of A, corresponding to an implied D/V ratio of 23.55%, more conservative than the industry average. **(Appendices 14, 15 and 16)**

The Sensitivity Analysis conducted to the WACC, and the g shows that the share price is considerably more sensitive to the variations in g than in the WACC. However, most scenarios suggest the company to be worth between €33/share and €42/share. **(Appendix 17)** Additionally, given that EBITDA assumptions were based on management forecasts, and for that reason could be somehow biased, it was conducted a sensitivity analysis to the EBITDA by applying a reduction factor. The analysis suggests that small changes to the EBITDA would significantly depreciate the share price, and thus the share price should lie between €30/share, very close to the pessimistic scenario of the DCF, and €40/share. **(Appendix 18)**

For the CCA, a list of companies operating in the automotive lighting and LED production industries, as of 30/09/2019, was gathered from Bloomberg (*Exhibit 7*). Two different approaches were used to determine OSRAM's valuation. The first was based on all selected companies operating in these industries. The second was based on OSRAM peer group, which was selected based on the relative size of Market Capitalization, meaning that companies trading below \$1 bn and significantly above \$5 billion were excluded as well as outliers in terms of trading multiples. For each approach, 3 different median multiples were calculated and used to determine OSRAM's implied valuation: i) Price/Earnings ratio (P/E); ii) EV/EBITDA and iii) EV/Sales. The valuation range lies between €8.30 and €20.60 per share (first approach) and between €8.30 and €18.16 per share (second approach). (*Appendices 19 and 20*)

For the PTA, a list of recent transactions (between 2016 and 2018) in the lighting and laser industries was collected from Bloomberg, including the transaction value and the EV/EBITDA multiple of each target company. The median calculated EV/EBITDA multiple for all the transactions was 15.05x and 14.76x, with outliers EV/EBITDA excluded (> 40x), which results in a valuation of €39.64/share and €38.79/share for OSRAM, respectively. (*Appendix 21*)

The CCA resulted in a significantly lower valuation for the company because it is based on an estimated EBITDA for the full year of 2019 of €283 million and revenues of €3,633 million, that reflects a year of extremely poor performance and thus, it does not incorporate any upside potential for the future. It would be expected that the PTA would calculate a considerable higher valuation for the share price than the DCF, given that it typically includes a premium paid by acquirers to get control over the target. However, as it was also calculated based on estimated EBITDA for 2019, the valuation, €38.79/share, is very close to the obtained through the DCF, €37.08/share. Nevertheless, it validates the intrinsic valuation of €37.08/share. (*Appendix 22*)

Lastly, based on the DCF and PTA for the three scenarios, the price recommendation range for OSRAM, as of 30/09/2019, lies between €30/share and €40/share, with a target price of

€38.14/share (the average of both methods). This figure more accurately reflects future growth prospects and is not overly influenced by the low EBITDA figure due to 2019's performance.

Question 3) Synergies represent the main and most consistent motivation for M&A, surpassing other common reasons. Existing literature underscores the critical role of synergy as the foremost driver in merger decisions. (Mukherjee, Kiymaz, and Baker 2005; Berkovitch and Narayanan 1993; Bradley, Desai, and Kim 1988). According to Damodaran (2005), synergies can be defined as *“the additional value that is generated by combining two firms, creating opportunities that would not been available to these firms operating independently”* and *“the magic ingredient that allows acquirers to pay billions of dollars in premiums in acquisitions”*. The author categorized M&A synergies into two main groups: operating and financial synergies. Operating synergies involve benefits such as economies of scale, stronger market power, and greater growth potential, enhancing operating income and accelerating growth, resulting in higher cash flows from existing assets. Financial synergies, on the other hand, lead to higher cash flows or reduced cost of capital for the combined entity, often through enhanced debt tax shields, diversification benefits, or increased debt capacity.

(Eccles, Lanes e Wilson 1999) identified five synergy types in M&A: cost savings, revenue enhancement, process improvements, financial engineering, and tax benefits. The authors argued that revenue enhancements are challenging to predict due to dependencies on external factors, with some firms excluding them from synergy projections. Cost savings, often derived from job and facility overlaps and better purchasing economies of scale, are the most common and easiest to estimate, despite being often overestimated by acquirers who also underestimate the time needed for realization, partly due to poor integration planning or employee resistance. It was also observed that firms in the same industry and region are more likely to achieve cost savings. On the other hand, process improvements, involving the sharing of best practices and competencies between companies, can lead to both revenue increases and cost savings.

The projected synergies for the OSRAM acquisition, amounting to €300 million annually are solely operating in nature, with 20% being associated with revenue enhancements and 80% associated with cost savings in Costs of Goods Sold (GOGS) and Operating Expenses (OPEX). On the revenue side, AMS wanted to explore cross-selling opportunities, through a complementary go-to-market strategy, made possible by the acquirer's expertise in serving mobile, consumer, and medical OEMs, combined with OSRAM's strong automotive and industrial presences. After the deal, each company could expand its market reach beyond what it could achieve separately. For instance, the acquisition will facilitate AMS's expansion into the automotive sector, particularly in autonomous driving systems. Nevertheless, growth synergies are the hardest to predict, requiring careful examination when being evaluated.

The cost-saving measures involve streamlining production processes across both companies, including the consolidation of the LED front-end production in Europe and the LED back-end production in Asia, allowing the company to achieve a higher level of economies scale and production efficiency which impacts directly COGS. Furthermore, the expected OPEX reductions derive from the alignment and integration of corporate functions, including marketing, branding, and IT, as well as the optimization of a unified R&D strategy. The proposed cost reductions appear feasible due to the companies' shared industry and proximity of their production facilities, as highlighted in *Exhibit 19*. However, the timing for implementation can be particularly challenging. AMS expects a 3-year period for total implementation, with most synergies expected to be materialized in the first 2 years after the acquisition. As highlighted by (Eccles, Lanes e Wilson 1999), this can be particularly challenging, with managers typically underestimating the necessary time for implementation. Additionally, and as discussed in Question 1), Kusewitt Jr. (1985) highlighted that larger target firms could pose integration challenges, which can complicate the integration further.

Therefore, to adequately conduct a valuation to the synergies cashflows, it is necessary to determine an appropriate discount rate to discount the synergies cashflows. It was assumed that the WACC of the combined company adequately captures these risks, given that it considers the individual risks of each firm involved in the integration process. It was estimated to be 6.83%, based on an unlevered beta of 0.96, calculated as the weighted average between the unlevered betas of each and individual valuations of each firm. **(Appendices 23 and 24)** For simplicity, AMS valuation of €2,709 million was computed through a CCA, available in Exhibit 5 and OSRAM intrinsic valuation of €3,582 million calculated in Question 2). **(Appendices 10 and 25)**

Considering AMS synergies estimate, as outlined in Exhibit 18, and their expectation to achieve these benefits over a three-year period, the associated cashflows were projected as detailed in Appendix 26. According to the projections and the discount rate of 6.83%, the synergies were estimated to be worth €2,918 million, equivalent to €30.20/share. **(Appendix 27)**

As mentioned above, the realization of synergies comes with several integration challenges that may impact their successful realization. In this transaction, differences of relative sizes between companies and external factors that can influence growth synergies were the most pronounced. Therefore, while the discount rate reflects each individual firm weighing risk, it may not fully capture the complexities of post-merger integration, leading to potential miscalculations. As such, a sensitivity analysis to the valuation of synergies to changes in the discount rate and the share of synergies was conducted, showing that small changes to these variables may significantly impact the valuation. For example, achieving only 80% of synergies (equivalent to disregarding the realization of revenue synergies) can lead to a 28.46% decrease in their value to €23.51/share. Furthermore, in scenarios where the discount rate approaches 8% and only 40% of the synergies are achieved, which is a realistic possibility considering the risks outlined earlier, the value of the synergies could potentially depreciate by over 50% **(Appendix 28)**

Based on the above and following a more conservative approach (synergies achievement rates between 50% and 70%), the synergies valuation range should lie between €10.73/share and €21.11/share, equivalent to €1,037 million and €2,039 million.

Question 4) On the strategic side, AMS should pursue the acquisition as the deal aligns with the recent aggressive growth strategy through M&A and aims at reducing reliance on a single customer and diversifying its revenue sources. Management anticipates significant synergies, but the deal faces major integration challenges given the players' size disparity, a major difference from previous acquisitions, increasing the risk of not fully realizing these synergies. Therefore, a price recommendation for the acquisition must take these risks into consideration. As discussed in Question 2), the target share price recommendation on a standalone basis is €38.14/share and supports AMS's initial bid of €38.50/share. Additionally, as discussed in Question 3), the proposed synergies have a present value of €2,918 million, equivalent to €30.20/share, considering a discount rate of 6.83% and a realization rate of 100%. Therefore, the recommended share price, if the value of synergies is included, will depend on the α , the share of synergies to be shared with the target shareholders, and the assumption on how much of these synergies will be realized. Thus, the range of acceptable offer values for OSRAM would be between €68.35/share if $\alpha=100\%$ and €38.14/share if $\alpha=0\%$. It would be more prudent to assume, however, that only half of the synergies would be realized as highlighted in Question 3), implying a recommended maximum offer price of €51.62/share. (**Appendix 29**)

As a final recommendation, while there is room for AMS's board to increase their offer, maintaining the current bid of €41.00/share serves as a safeguard against the risks associated with not fully realizing the proposed synergies. This offer already represents a 7% premium over the standalone value (€38.14/share) and implies that either 10% of the synergies (assuming a 100% realization rate) or 25% of the synergies (assuming a 50% realization rate) are effectively being shared with OSRAM's shareholders in the deal. (**Appendix 29**)

References

- Berkovitch, Elazar, and M P Narayanan. 1993. "Motives for Takeovers: An Empirical Investigation." *Journal of Financial and Quantitative Analysis* 28 (3): 347–62.
https://EconPapers.repec.org/RePEc:cup:jfinqa:v:28:y:1993:i:03:p:347-362_00.
- Bradley, Michael, Anand Desai, and E Han Kim. 1988. "Synergistic Gains from Corporate Acquisitions and Their Division between the Stockholders of Target and Acquiring Firms." *Journal of Financial Economics* 21 (1): 3–40.
<https://EconPapers.repec.org/RePEc:eee:jfinec:v:21:y:1988:i:1:p:3-40>.
- Damodaran, Aswath. 2005. "The Value of Synergy."
- DePamphilis, Donald M. 2019. *Mergers, Acquisitions, and Other Restructuring Activities an Integrated Approach to Process, Tools, Cases, and Solutions* Donald M. DePamphilis. 10th ed. Elsevier.
- Durmaz, Yakup, and Ahmet Ilhan. 2015. "A Theoretical Approach to Purpose and Type of Strategy." *International Journal of Business and Management* 10 (4).
<https://doi.org/10.5539/ijbm.v10n4p210>.
- Gaughan, Patrick A. 2013. *Maximizing Corporate Value Through Mergers and Acquisitions : A Strategic Growth Guide*. Wiley Finance Series. New York: Wiley.
- Hayward, Mathew L.A. 2002. "When Do Firms Learn from Their Acquisition Experience? Evidence from 1990-1995." *Strategic Management Journal* 23 (1): 21–39.
<https://doi.org/10.1002/smj.207>.
- Hitt, Michael A., R. Duane Ireland, S. Michael Camp, and Donald L. Sexton. 2001. "Strategic Entrepreneurship: Entrepreneurial Strategies for Wealth Creation." *Strategic Management Journal* 22 (6–7): 479–91. <https://doi.org/10.1002/smj.196>.
- Hogarty, Thomas F. 1970. "The Profitability of Corporate Mergers." *The Journal of Business* 43 (3): 317–27. <https://EconPapers.repec.org/RePEc:ucp:jnlbus:v:43:y:1970:i:3:p:317-27>.
- Joy, Joseph. 2018. *Divestitures and Spin-Offs : Lessons Learned in the Trenches of the World's Largest M&A Deals*. *Management for Professionals*. Boston: Springer.
<https://resolver.ebscohost.com/openurl?custid=s1020420&groupid=main&profile=ftf&authtype=ip,shib&isbn=978-1-4939-7662-1>.
- Kusewitt Jr., John B. 1985. "An Exploratory Study of Strategic Acquisition Factors Relating to Performance." *Strategic Management Journal* 6 (2): 151–69.
<https://doi.org/https://doi.org/10.1002/smj.4250060205>.
- Mukherjee, Tarun, Halil Kiymaz, and H Baker. 2005. "Merger Motives and Target Valuation: A Survey of Evidence from CFOs." *Journal of Applied Finance* 14 (February).
- Rosenbaum, Joshua, and Joshua Pearl. 2009. *Investment Banking : Valuation, Leveraged Buyouts, and Mergers and Acquisitions*. Wiley Finance. New Jersey: John Wiley.

- Zollo, Maurizio, and Harbir Singh. 2004. "Deliberate Learning in Corporate Acquisitions: Post-Acquisition Strategies and Integration Capability in U.S. Bank Mergers." *Strategic Management Journal* 25 (13): 1233–56. <https://doi.org/10.1002/smj.426>.
- Zook, Chris. 2004. "Increasing the Odds of Successful Growth: The Critical Prelude to Moving 'beyond the Core.'" *Strategy & Leadership* 32 (4): 17–23. <https://doi.org/10.1108/10878570410547661>.

Appendix List

Appendix 1 OSRAM Revenue Breakdown	84
Appendix 2 OSRAM Revenue Assumptions	84
Appendix 3 EBITDA Margin Assumptions	85
Appendix 4 CAPEX and D&A Historical Benchmark and Assumptions.....	85
Appendix 5 NWC Assumptions and Projections for the Base Scenario.....	86
Appendix 6 Tax Rate Assumptions	87
Appendix 7 Free Cashflow Operational Assumptions and Projections - Base Scenario	88
Appendix 8 Free Cashflow Operational Assumptions and Projections - Best Scenario.....	90
Appendix 9 Free Cashflow Operational Assumptions and Projections - Worst Scenario	92
Appendix 10 DCF Analysis Valuation Summary - Base Scenario (in million of EUR).....	94
Appendix 11 DCF Analysis Valuation Summary - Best Scenario (in million of EUR)	94
Appendix 12 DCF Analysis Valuation Summary - Worst Scenario (in million of EUR).....	94
Appendix 13 Perpetual Growth Rate Assumptions	94
Appendix 14 WACC Assumptions.....	95
Appendix 15 OSRAM Historical D/V Analysis	95
Appendix 16 Lighting Peer Group D/V Analysis	96
Appendix 17 Sensitivity Analysis to OSRAM's target share price to changes in the WACC and Terminal Value growth rate.....	96
Appendix 18 Sensitivity Analysis to OSRAM's target share price to changes in EBITDA ...	96
Appendix 19 OSRAM valuation based on CCA (in million of EUR).....	97
Appendix 20 OSRAM valuation based on CCA (in million of EUR).....	98
Appendix 21 OSRAM valuation based on PTA (in million of EUR).....	98
Appendix 22 OSRAM Valuation Summary.....	99
Appendix 23 Synergies Discount Rate Assumptions.....	100
Appendix 24 AMS Historical D/V and Tax Analysis	100
Appendix 25 AMS Valuation according to CCA.....	101
Appendix 26 Synergies Free Cash flows Projections	103
Appendix 27 DCF Analysis Synergies Valuation Summary.....	104
Appendix 28 Sensitivity Analysis to the valuation of synergies to changes in the WACC and the share of synergies realized	104
Appendix 29 Range of Offer Prices for OSRAM as a function of synergies paid to the target shareholders and share of synergies achieved	105

Appendix

Appendix 1 OSRAM Revenue Breakdown

<i>in millions of EUR, unless stated otherwise</i>	FY 2013		FY 2014	
Specialty Lighting	1 456	28%	1 551	30%
Opto Semiconductors	654	12%	688	13%
Advanced Photonics	2 110	40%	2 239	44%
Lighting Solutions & Systems	3 161	60%	2 886	56%
Total	5 271	100%	5 125	100%

Source: Company Reports

Appendix 2 OSRAM Revenue Assumptions

Revenue Growth Rates Assumptions:	Short Term (2019)	Medium Term (1 to 5 years)			Long Term (> 5 years)
	Base Scenario	Worst Scenario	Base Scenario	Best Scenario	Perpetual Growth
Opto Semiconductors	-20,48%	8,00%	10,00%	12,00%	2,34%
Automotive	-9,63%	3,00%	5,00%	7,00%	
Digital	-3,97%	3,00%	6,50%	10,00%	

Assumption	Reasoning
Revenue Growth Rate for 2019	Revenue growth rate from 2018 H1 to 2019 H1 for each segment, reduced by 1% to account for negative management expectations for Q4
Revenue Growth Rate for 2020	Half the medium-term projection rate for each segment, a conservative stance due to the significant revenue decrease from the previous year
Revenue Growth Rate 2021-2024	Reflects management's medium-term outlook
Revenue Growth Rate 2025-2028	Each segment's growth rate gradually aligns with the revenue perpetual growth rate of 2,34%, using the formula: Previous Year Growth Rate-(Medium Term Growth Rate - Long Term Growth Rate)/(2029 - 2023)
Intersegment Revenues	Applicable to the OS business segment, set at 23.55% of the AM and DI segments, averaged over 2016-2018
Revenue Adjustments	0.98% of total segment revenues (including intersegment) for Corporate Items, Pensions, and other reconciliation elements, averaged from 2015 to Q3 2019

Appendix 3 EBITDA Margin Assumptions

EBITDA Margin Assumptions:	Short/Medium Term (1 to 5 years)			Long Term (> 5 years)
	Worst Scenario	Base Scenario	Best Scenario	Base Scenario
Opto Semiconductors	23%	26%	29%	
Intermediate change	-0,50%	0,25%	1,00%	
Automotive	9%	10,00%	11%	
Intermediate change	-0,50%	-0,50%	-0,25%	
Digital	5%	8%	10%	> 10%
Intermediate change	0,75%	0,75%	1,50%	
			0,75%	
Aggregated – FY 2019	8%		10%	
EBITDA – Adjustments and Special Items (% of Total Revenues)	-2%			

Assumption	Reasoning
EBITDA Margin for 2019	OSRAM's management anticipated a strong finish to the year after earlier weaker performance, as indicated in the Q3 2019 Earnings Call, leading to the assumption of H1 2018 margins to each segment for the final quarter.
EBITDA Margin for 2020	For the OS segment, the average margin from 2015 to 2019 was employed, while for the other segments, due to limited pre-2018 data, margins were based on the H1 2018 and H1 2019 average
EBITDA Margin from 2021 until 2029	EBITDA margins for each segment were projected to gradually align with the medium-term management forecasts, changing at a consistent rate annually to mitigate sudden margin fluctuations
EBITDA Adjustments	-2% of the Aggregated EBITDA for the three segments for Corporate Items, Pensions, and other reconciliation elements, averaged from 2015 to Q3 2019
Intermediate changes	For each segment and, it was assumed that the EBITDA Margin would converge smoothly at these rates to avoid abrupt changes to margins. For example, for the automotive segment, for the base scenario, it was assumed that the EBITDA Margin would decrease at 0,50%/year until the EBITDA margin target of 10% is reached.

Appendix 4 CAPEX and D&A Historical Benchmark and Assumptions

D&A % of Total Revenues	Average	Median
FY2015-FY2018	4,88%	4,85%
FY2017-FY2018	4,90%	4,90%
H1 FY2018-FY2019	6,95%	
CAPEX % of Total Revenues	Average	Median
FY2015-FY2018	8,45%	8,60%
FY2017-FY2019 YTD	9,22%	9,38%
FY2015-FY2019 YTD	8,30%	7,83%

Assumptions: % of Total Revenues	Short/Medium Term (1 to 5 years)		
	Worst Scenario	Base Scenario	Best Scenario
CAPEX	7,00%	8,45%	9,00%
D&A	6,95%	6,54%	4,85%

Scenario:	Reasoning
Capital Expenditures (CAPEX)	
Base Scenario	Historical average between FY2015 and FY2018.
Worst Scenario	Management Assumption in the last Strategy Update - it was assumed that under this scenario, where the revenue growth would be lower, the company would need to invest less in CAPEX.
Best Scenario	Management Assumption in the last Strategy Update - it was assumed that under this scenario, where the revenue growth would be higher, the company would need to invest more in CAPEX to achieve growth.
Depreciation and Amortization (D&A)	
Base Scenario	The estimation was based on the projected values of Depreciated Assets, derived from a regression analysis of the evolution of Depreciated Assets, including Property, Plant, and Equipment, as well as Intangible Assets, from FY2015 to FY2018 - an average of 6,54% of revenues.
Worst Scenario	Worst figure from historical performance: average between H1 2018 and H1 2019.
Best Scenario	Best figure from historical performance: median between FY2015 and FY2018.

Appendix 5 NWC Assumptions and Projections for the Base Scenario

Scenario	Reasoning
Base Scenario	Historical average for each NWC component relative to the number of days of revenues from 2016 to 2018; FY 2015 and FY2019 were excluded due to significant fluctuations
Worst Scenario	An increase of 10% compared to the base scenario
Best Scenario	A decrease of 10% relative to the base scenario
Working Cash	5% of Revenues
FY2019	The full-year projection for 2019 is based on figures recorded up to Q3

Assumptions:	Short/Medium Term (1 to 5 years)		
	DSO	DIO	DPO
Base Scenario	46	52	52
Worst Scenario	51	57	57
Best Scenario	41	47	47

in million of EUR, unless stated otherwise			Historical Data					Forecast - Base Scenario																							
			Year		FY 2018			FY 2019 YTD		FY 2019 (E)		FY 2020 (E)		FY 2021 (E)		FY 2022 (E)		FY 2023 (E)		FY 2024 (E)		FY 2025 (E)		FY 2026 (E)		FY 2027 (E)		FY 2028 (E)		FY 2029 (E)	
			Initial Date	Final Date	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019 YTD	FY 2019 (E)	FY 2020 (E)	FY 2021 (E)	FY 2022 (E)	FY 2023 (E)	FY 2024 (E)	FY 2025 (E)	FY 2026 (E)	FY 2027 (E)	FY 2028 (E)	FY 2029 (E)											

Appendix 6 Tax Rate Assumptions

Effective Tax Rate Historical Analysis in millions of EUR, unless stated otherwise	FY 2015	FY 2016	FY 2017	FY 2018	Average FY2015-18
Income before income taxes	322	701	389	197	
Income taxes	94	169	114	55	
Effective Tax Rate	29,19%	24,11%	29,31%	27,92%	27,63%

Appendix 7 Free Cashflow Operational Assumptions and Projections - Base Scenario

Base Scenario (I)	FY 2020 (E)	FY 2021 (E)	FY 2022 (E)	FY 2023 (E)	FY 2024 (E)	FY 2025 (E)	FY 2026 (E)	FY 2027 (E)	FY 2028 (E)	FY 2029 (E)
External Revenues Growth (% change):										
Opto Semiconductors (OS)	5,00%	10,00%	10,00%	10,00%	10,00%	8,72%	7,45%	6,17%	4,89%	2,34%
Automotive (AM)	2,50%	5,00%	5,00%	5,00%	5,00%	4,56%	4,11%	3,67%	3,23%	2,34%
Digital (DI)	3,25%	6,50%	6,50%	6,50%	6,50%	5,81%	5,11%	4,42%	3,73%	2,34%
Intersegment Revenues (% of AM and DI External Revenues)	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Opto Semiconductors (OS)	23,55%	23,55%	23,55%	23,55%	23,55%	23,55%	23,55%	23,55%	23,55%	23,55%
Revenue Adjustments (% of Total Segment Revenues)	0,98%	0,98%	0,98%	0,98%	0,98%	0,98%	0,98%	0,98%	0,98%	0,98%
EBITDA Margin (% of Revenues):										
Opto Semiconductors (OS)	24,52%	24,77%	25,02%	25,27%	25,52%	26,00%	26,00%	26,00%	26,00%	26,00%
Automotive (AM)	11,69%	11,19%	10,69%	10,19%	9,69%	10,00%	10,00%	10,00%	10,00%	10,00%
Digital (DI)	0,92%	1,67%	2,42%	3,17%	3,92%	4,67%	5,42%	6,17%	6,92%	7,67%
Adjustments and Special Items	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%
Depreciation and Amortization (% of Revenues)	6,57%	6,59%	6,59%	6,57%	6,52%	6,50%	6,49%	6,52%	6,57%	6,70%
Tax Rate (% of Earnings Before Tax)	27,63%	27,63%	27,63%	27,63%	27,63%	27,63%	27,63%	27,63%	27,63%	27,63%
NWC (% of Revenues)	17,61%	17,61%	17,61%	17,61%	17,61%	17,61%	17,61%	17,61%	17,61%	17,61%
Capital Expenditures (% of Revenues)	8,45%	8,45%	8,45%	8,45%	8,45%	8,45%	8,45%	8,45%	8,45%	8,45%

in million of EUR, unless stated otherwise			Historical Data								Forecast																		
			Year		FY 2016		FY 2017		FY 2018		FY 2019 YTD		FY 2020 (E)		FY 2021 (E)		FY 2022 (E)		FY 2023 (E)		FY 2024 (E)		FY 2025 (E)		FY 2026 (E)		FY 2027 (E)		FY 2028 (E)
Initial Date	Final Date		FY 2015	FY 2016	FY 2017	FY 2018	FY 2019 YTD	FY 2019	FY 2019 (E)	FY 2020 (E)	FY 2021 (E)	FY 2022 (E)	FY 2023 (E)	FY 2024 (E)	FY 2025 (E)	FY 2026 (E)	FY 2027 (E)	FY 2028 (E)	FY 2029 (E)										
Period			01/10/2014	01/10/2017	01/04/2018	01/10/2017	01/10/2018	01/10/2018	30/09/2019	01/10/2019	30/09/2020	30/09/2021	30/09/2022	30/09/2023	30/09/2024	30/09/2025	30/09/2026	30/09/2027	30/09/2028	30/09/2029									
Days in Period			30/09/2015	31/03/2018	30/09/2018	30/09/2018	30/06/2019	0	1	2	3	4	5	6	7	8	9	10											
External Revenues:																													
Opto Semiconductors (OS)																													
Automotive (AM)																													
Digital (DI)																													
Intersegment Revenues:																													
Opto Semiconductors (OS)																													
Revenue Adjustments																													
Total Net Revenues																													
EBITDA:																													
Opto Semiconductors (OS)																													
Automotive (AM)																													
Digital (DI)																													
Adjustments and Special Items																													
(+) Total EBITDA																													
EBITDA Margin																													
(-) Depreciation and Amortization																													
(-) EBIT																													
EBIT Margin																													
(-) Taxes																													
(+) NOPAT																													
(-) Depreciation and Amortization																													
(-) Δ NWC																													
NWC																													
(-) CAPEX																													
(-) Unlevered FCF																													
Discounted FCF																													

Appendix 8 Free Cashflow Operational Assumptions and Projections - Best Scenario

Best Scenario (2)	FY 2020 (E)	FY 2021 (E)	FY 2022 (E)	FY 2023 (E)	FY 2024 (E)	FY 2025 (E)	FY 2026 (E)	FY 2027 (E)	FY 2028 (E)	FY 2029 (E)
External Revenues Growth (% change):										
Opto Semiconductors (OS)	6,00%	12,00%	12,00%	12,00%	12,00%	12,00%	10,39%	8,78%	7,17%	2,34%
Automotive (AM)	3,50%	7,00%	7,00%	7,00%	7,00%	7,00%	6,22%	5,45%	4,67%	2,34%
Digital (DI)	5,00%	10,00%	10,00%	10,00%	10,00%	10,00%	8,72%	7,45%	6,17%	2,34%
Intersegment Revenues (% of AM and DI External Revenues)	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Opto Semiconductors (OS)	23,55%	23,55%	23,55%	23,55%	23,55%	23,55%	23,55%	23,55%	23,55%	23,55%
Revenue Adjustments (% of Total Segment Revenues)	0,98%	0,98%	0,98%	0,98%	0,98%	0,98%	0,98%	0,98%	0,98%	0,98%
EBITDA Margin (% of Revenues):										
Opto Semiconductors (OS)	24,52%	25,52%	26,52%	27,52%	29,00%	29,00%	29,00%	29,00%	29,00%	29,00%
Automotive (AM)	11,69%	11,44%	11,19%	10,94%	11,00%	11,00%	11,00%	11,00%	11,00%	11,00%
Digital (DI)	0,92%	2,42%	3,92%	5,42%	6,92%	8,42%	9,92%	10,67%	11,42%	12,17%
Adjustments and Special Items	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%
Depreciation and Amortization (% of Revenues)	4,85%	4,85%	4,85%	4,85%	4,85%	4,85%	4,85%	4,85%	4,85%	4,85%
Tax Rate (% of Earnings Before Tax)	27,63%	27,63%	27,63%	27,63%	27,63%	27,63%	27,63%	27,63%	27,63%	27,63%
NWC (% of Revenues)	16,35%	16,35%	16,35%	16,35%	16,35%	16,35%	16,35%	16,35%	16,35%	16,35%
Capital Expenditures (% of Revenues)	9,00%	9,00%	9,00%	9,00%	9,00%	9,00%	9,00%	9,00%	9,00%	9,00%

in million of EUR, unless stated otherwise					Historical Data												Forecast																					
Year	FY 2015				FY 2016				FY 2017				FY 2018				FY 2019																					
Initial Date	01/10/2014				01/10/2017				01/04/2018				01/10/2017				01/10/2018																					
Final Date	30/09/2015				31/03/2018				30/09/2018				30/09/2018				30/09/2018				30/09/2019																	
Period																																						
Days in Period																																						

Appendix 9 Free Cashflow Operational Assumptions and Projections - Worst Scenario

Worst Scenario (3)	FY 2020 (E)	FY 2021 (E)	FY 2022 (E)	FY 2023 (E)	FY 2024 (E)	FY 2025 (E)	FY 2026 (E)	FY 2027 (E)	FY 2028 (E)	FY 2029 (E)
External Revenues Growth (% change):										
Opto Semiconductors (OS)	5,00%	10,00%	10,00%	10,00%	10,00%	8,72%	7,45%	6,17%	4,89%	2,34%
Automotive (AM)	2,50%	5,00%	5,00%	5,00%	5,00%	4,56%	4,11%	3,67%	3,23%	2,34%
Digital (DI)	3,25%	6,50%	6,50%	6,50%	6,50%	5,81%	5,11%	4,42%	3,73%	2,34%
Intersegment Revenues (% of AM and DI External Revenues)	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Opto Semiconductors (OS)	23,55%	23,55%	23,55%	23,55%	23,55%	23,55%	23,55%	23,55%	23,55%	23,55%
Revenue Adjustments (% of Total Segment Revenues)	0,98%	0,98%	0,98%	0,98%	0,98%	0,98%	0,98%	0,98%	0,98%	0,98%
EBITDA Margin (% of Revenues):										
Opto Semiconductors (OS)	24,52%	24,77%	25,02%	25,27%	25,52%	26,00%	26,00%	26,00%	26,00%	26,00%
Automotive (AM)	11,69%	11,19%	10,69%	10,19%	9,69%	10,00%	10,00%	10,00%	10,00%	10,00%
Digital (DI)	0,92%	1,67%	2,42%	3,17%	3,92%	4,67%	5,42%	6,17%	6,92%	7,67%
Adjustments and Special Items	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%
Depreciation and Amortization (% of Revenues)	6,57%	6,59%	6,59%	6,57%	6,52%	6,50%	6,49%	6,52%	6,57%	6,70%
Tax Rate (% of Earnings Before Tax)	27,63%	27,63%	27,63%	27,63%	27,63%	27,63%	27,63%	27,63%	27,63%	27,63%
NWC (% of Revenues)	17,61%	17,61%	17,61%	17,61%	17,61%	17,61%	17,61%	17,61%	17,61%	17,61%
Capital Expenditures (% of Revenues)	8,45%	8,45%	8,45%	8,45%	8,45%	8,45%	8,45%	8,45%	8,45%	8,45%

in million of EUR, unless stated otherwise		Historical Data							Forecast										
Year		FY 2015	FY 2016	FY 2017	FY 2018	FY 2019 YTD			FY 2020 (E)	FY 2021 (E)	FY 2022 (E)	FY 2023 (E)	FY 2024 (E)	FY 2025 (E)	FY 2026 (E)	FY 2027 (E)	FY 2028 (E)	FY 2029 (E)	
Initial Date		01/10/2014	01/10/2017	01/04/2018	01/10/2017	01/10/2018	01/10/2019	01/10/2020	01/10/2020	01/10/2021	01/10/2021	01/10/2022	01/10/2023	01/10/2024	01/10/2025	01/10/2026	01/10/2027	01/10/2028	01/10/2028
Final Date		30/09/2015	31/03/2018	30/09/2018	30/09/2018	30/06/2019	30/09/2019	30/09/2020	30/09/2020	30/09/2021	30/09/2022	30/09/2023	30/09/2024	30/09/2025	30/09/2026	30/09/2027	30/09/2028	30/09/2029	30/09/2029
Period							0	1	2	3	3	4	5	6	7	8	9	10	
Days in Period																			
External Revenues:																			
Opto Semiconductors (OS)		767	801	831	861	532	685	719	791	870	957	1 053	1 144	1 230	1 305	1 369	1 401		
Automotive (AM)		1 897	2 010	2 173	2 156	1 320	1 949	1 997	2 097	2 202	2 312	2 428	2 539	2 643	2 740	2 828	2 895		
Digital (DI)		905	971	1 086	1 041	651	999	1 032	1 099	1 170	1 246	1 327	1 404	1 476	1 541	1 599	1 636		
Intersegment Revenues:																			
Opto Semiconductors (OS)		525	623	854	864	541	694	713	753	794	838	884	929	970	1 008	1 043	1 067		
Revenue Adjustments		4	37	78	57	38	42	44	46	49	52	56	59	62	65	67	69		
Total Net Revenues		4 098	4 442	5 022	4 979	3 082	4 369	4 505	4 786	5 086	5 406	5 748	6 075	6 381	6 660	6 906	7 068		
EBITDA:																			
Opto Semiconductors (OS)						122	204	351	371	391	413	446	477	506	532	555	568		
Automotive (AM)						98	185	233	235	235	236	235	233	238	247	255	261		
Digital (DI)						-31	-18	9	18	28	39	52	66	74	77	80	82		
Adjustments and Special Items						-68	-89	-92	-97	-103	-110	-117	-123	-130	-135	-140	-144		
Total EBITDA		543	620	621	308	121	283	503	526	552	578	616	652	688	720	749	766		
EBITDA Margin		13%	14%	12%	6%	4%	6,47%	11,10%	11,00%	10,85%	10,70%	10,72%	10,74%	10,78%	10,82%	10,84%	10,84%		
Depreciation and Amortization		205	210	224	268	261	276	313	333	353	376	399	422	443	463	480	491		
EBIT		338	410	397	40	-140	6	189	194	198	203	217	230	245	258	269	275		
EBIT Margin		8%	9%	8%	1%	-5%	0%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%		
Taxes		94	169	114	55	-29	0	52	54	55	56	60	64	68	71	74	76		
NOPAT		244	241	283	-15	-111	6	137	140	143	147	157	166	177	187	195	199		
Depreciation and Amortization		205	210	224	268	261	276	313	333	353	376	399	422	443	463	480	491		
Δ NWC		1 341	-483	-60	95	-22	605	-646	53	57	60	65	62	58	53	47	31		
NWC		1 341	858	797	892	870	1 497	850	903	960	1 020	1 085	1 147	1 204	1 257	1 304	1 334		
CAPEX		246	350	537	347	195	369	315	335	356	378	402	425	447	466	483	495		
Unlevered FCF		-1 138	584	30	-189	-23	-691	781	85	84	84	89	102	116	130	145	165		
Discounted FCF							-691	738	76	71	67	67	73	78	83	87	94		

Appendix 10 DCF Analysis Valuation Summary - Base Scenario (in millions of EUR)

Intrinsic Value:	
Sum of Discounted FCF	1 183
Terminal Value	2 823
Enterprise Value	4 006
Net Debt	424
Equity Value	3 582
Nr. Of Basic Shares outstanding (in millions)	97
Target Per Share Price (€)	37,08

Appendix 11 DCF Analysis Valuation Summary - Best Scenario (in millions of EUR)

Intrinsic Value:	
Sum of Discounted FCF	1 376
Terminal Value	4 690
Enterprise Value	6 066
Net Debt	424
Equity Value	5 642
Nr. Of Basic Shares outstanding (in millions)	97
Target Per Share Price (€)	58,40

Appendix 12 DCF Analysis Valuation Summary - Worst Scenario (in millions of EUR)

Intrinsic Value:	
Sum of Discounted FCF	1 436
Terminal Value	1 634
Enterprise Value	3 070
Net Debt	424
Equity Value	2 646
Nr. Of Basic Shares outstanding (in millions)	97
Target Per Share Price (€)	27,39

Appendix 13 Perpetual Growth Rate Assumptions

Region	Long-Term Growth Rate Assumption	Revenue Weight (Average FY2015-FY2018)
EMEA	2,00%	38,00%
APAC	3,00%	34,01%
Americas	2,00%	27,98%
Perpetual Growth Rate Assumption (Weighted Average Growth Rate)		2,34%

in millions of EUR, unless stated otherwise		FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	H1 2018	H2 2018	H1 2019
		Revenue by region (by customer location)								
EMEA		2265	2269	1396	1457	1553	1514	649	865	585
	Region Weight	43%	44%	39%	38%	38%	37%	35%	39%	35%
therein Germany		755	781	589	589	664	659	432	227	333
APAC		1257	1234	1175	1228	1445	1469	700	769	588
	Region Weight	24%	24%	33%	32%	35%	36%	37%	34%	35%
therein China (Including Hong Kong) and Taiwan		687	674	700	712	837	883	500	383	394
Americas		1766	1638	1000	1100	1129	1132	529	603	516
	Region Weight	33%	32%	28%	29%	27%	28%	28%	27%	31%
therein USA		1240	1155	803	890	880	904	458	446	388
OSRAM (continuing operations)		5 288	5 141	3 571	3 785	4 127	4 115	1 878	2 237	1 689

Appendix 14 WACC Assumptions

Assumptions:	Reasoning:
D/V (historical)	2% Average 4Y D/E (after OSRAM's Restructuring)
Beta_e (historical)	0,90 Adjusted 4Y Beta (after OSRAM's Restructuring) (using SMI Index); Source: Bloomberg
Beta_u	0,88
D/V target	23,6% Derived from the Industry Leverage Ratio; adjusted to account for Management prospects of "Strong capital structure with leverage potential "and "Need for prudence, targeting Investment Grade"; assumption: the company is targeting credit rating score of A
Beta_d	0,05 Assumption: the company is targeting a credit rating score of A
Beta_e	1,08
Risk free rate	1,1% Germany Risk Free Rate; Source: <i>Market Risk Premium and Risk-Free Rate Used for 69 Countries in 2019: A Survey</i>
Equity Risk Premium	5,7% Germany MRP; Source: <i>Market Risk Premium and Risk-Free Rate Used for 69 Countries in 2019: A Survey</i>
Tax Rate	27,6% Average Effective Tax Rate 4Y (FY2015-FY2018)
Cost of Debt (Pre-Tax)	1,39%
Cost of Equity	7,24%
WACC (post-tax)	5,77%

Appendix 15 OSRAM Historical D/V Analysis

D/V Historical Analysis in millions of EUR, unless stated otherwise	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
LT Debt	295	138	50	42	184	152
Interest Expenses	32	41	20	17	12	10
# Shares Outstanding (in Millions)	105	195	105	104	98	97
Share Price EoY (in €)	33	27	32	43	65	33
Market Capitalization	3 496	5 198	3 383	4 407	6 329	3 243
Debt/Value	8%	3%	1%	1%	3%	4%

Appendix 16 Lighting Peer Group D/V Analysis

Lighting Peer Group <i>in millions of EUR, unless stated otherwise</i>	Debt 30/09/2019	Market Capitalization 30/09/20219	D/V
HELLA GMBH & CO KGAA	1 782	4 979	26%
LEGRAND SA	1 782	5 099	54%
SEOUL SEMICONDUCTOR CO LTD	5 902	3 531	33%
EVERLIGHT ELECTRONICS CO LTD	1 756	2 250	46%
Industry Average			40%

Appendix 17 Sensitivity Analysis to OSRAM's target share price to changes in the WACC and Terminal Value growth rate

WACC	TV Growth Rate (g)									
		1,34%	1,59%	1,84%	2,09%	2,34%	2,59%	2,84%	3,09%	3,34%
	4,77%	30,67	32,07	33,64	35,44	37,49	39,86	42,65	45,95	49,93
	5,02%	30,56	31,96	33,54	35,33	37,38	39,76	42,54	45,84	49,83
	5,27%	30,46	31,86	33,43	35,22	37,28	39,65	42,44	45,74	49,72
	5,52%	30,35	31,75	33,33	35,12	37,18	39,55	42,33	45,64	49,62
	5,77%	30,25	31,65	33,23	35,02	37,08	39,45	42,23	45,54	49,52
	6,02%	30,16	31,55	33,13	34,92	36,98	39,35	42,14	45,44	49,42
	6,27%	30,06	31,46	33,04	34,83	36,88	39,26	42,04	45,34	49,32
	6,52%	29,96	31,36	32,94	34,73	36,79	39,16	41,94	45,25	49,23
	6,77%	29,87	31,27	32,85	34,64	36,69	39,07	41,85	45,15	49,13

Appendix 18 Sensitivity Analysis to OSRAM's target share price to changes in the EBITDA

EBITDA Reduction factor	Share Price (€)	
	-7,50%	25,48
	-6,00%	27,80
	-4,50%	30,12
	-3,00%	32,44
	-1,50%	34,76
	0,00 %	37,08
	1,50%	39,40
	3,00%	41,72
	4,50%	44,03

Appendix 19 OSRAM valuation based on CCA (in millions of EUR)

Company	Market Valuation ⁽¹⁾		LTM ⁽²⁾ Financial KPIs					LTM Profitability Margins (%)				Coverage Ratios			EV/Revenues	EV/EBITDA	EV/EBIT	EV/FCF	P/E	P/FCF
	Market Capitalization	Enterprise Value (EV)	Revenue	Gross Profit	EBITDA	EBIT	Net Income	Gross Profit	EBITDA	EBIT	Net Income	D/E	Debt/EBITDA	Net Debt/EBITDA						
HELLA GMBH & CO KGAA	4 979	4 859	7 995	2 062	1 306	868	722	27%	13%	8%	9%	36%	1,36x	,33x	,66x	3,94x	6,08x	14,93x	6,90x	15,30x
SCHAEFFLER AG - PREF	5 099	8 369	16 573	4 215	2 391	1 388	905	25%	14%	8%	5%	116%	2,47x	1,41x	,53x	3,95x	7,68x	17,52x	5,63x	10,68x
SIGNIFY NV	3 531	4 552	7 334	2 743	786	506	330	37%	11%	7%	4%	50%	2,23x	1,15x	,67x	5,93x	9,58x	8,04x	10,71x	6,24x
LG INNOTEK CO LTD	2 250	3 507	6 839	732	695	210	125	8%	10%	3%	2%	84,49%	2,74x	1,95x	,54x	4,72x	14,14x	25,56x	18,00x	16,40x
Highest	5 099	8 369	16 573	4 215	2 391	1 388	905	37,35%	14,39%	8,34%	9,03%	115,7%	2,74x	1,95x	,67x	5,93x	14,14x	25,56x	18,00x	16,40x
Lowest	2 250	3 507	6 839	732	695	210	125	7,99%	10,17%	3,08%	1,83%	35,79%	1,36x	,33x	,53x	3,94x	6,08x	8,04x	5,63x	6,24x
Mean	3 965	5 322	9 686	2 438	1 294	743	520	24,51%	12,20%	6,48%	5,20%	71,45%	2,20x	1,21x	,60x	4,64x	9,37x	16,51x	10,31x	12,15x
Median	4 255	4 706	7 665	2 402	1 046	687	526	26,35%	12,11%	7,25%	4,98%	67,12%	2,35x	1,28x	,60x	4,34x	8,63x	16,23x	8,80x	12,99x

Excluded Company from Selected Companies (Exhibit 5):	Criteria for exclusion:
LEGRAND SA	-Market Capitalization significantly above \$5bn
SEOUL SEMICONDUCTOR CO LTD	
EVERLIGHT ELECTRONICS CO LTD	
FAGERHULT GROUP AB	-Market Capitalization significantly below \$5bn; EV/EBITDA multiple of <u>10,25x</u> is a clear outlier

Appendix 20 OSRAM valuation based on CCA (in millions of EUR)

Implied Valuation (P/E)	All	Peer Group
Median P/E Multiple	13,4x	8,8x
OSRAM EPS - FY 2018	1,42	1,42
Target Per Share Price (€)	19,02	12,50

Implied Valuation (EV/EBITDA)	All	Peer Group
Median EV/EBITDA Multiple	5,3x	4,3x
OSRAM Forecasted EBITDA FY2019	283	283
OSRAM EV	1 505	1 226
OSRAM Net Debt	424	424
OSRAM Equity Value	1 081	802
OSRAM Shares (in million)	97	97
Target Per Share Price (€)	11,19	8,30

Implied Valuation (EV/Sales)	All	Peer Group
Median EV/Revenues Multiple	,7x	,6x
OSRAM Forecasted Revenues for FY 2019	3 633	3 633
OSRAM EV	2 414	2 179
OSRAM Net Debt	424	424
OSRAM Equity Value	1 990	1 755
OSRAM Shares (in million)	97	97
Target Per Share Price (€)	20,60	18,16

Appendix 21 OSRAM valuation based on PTA (in millions of EUR)

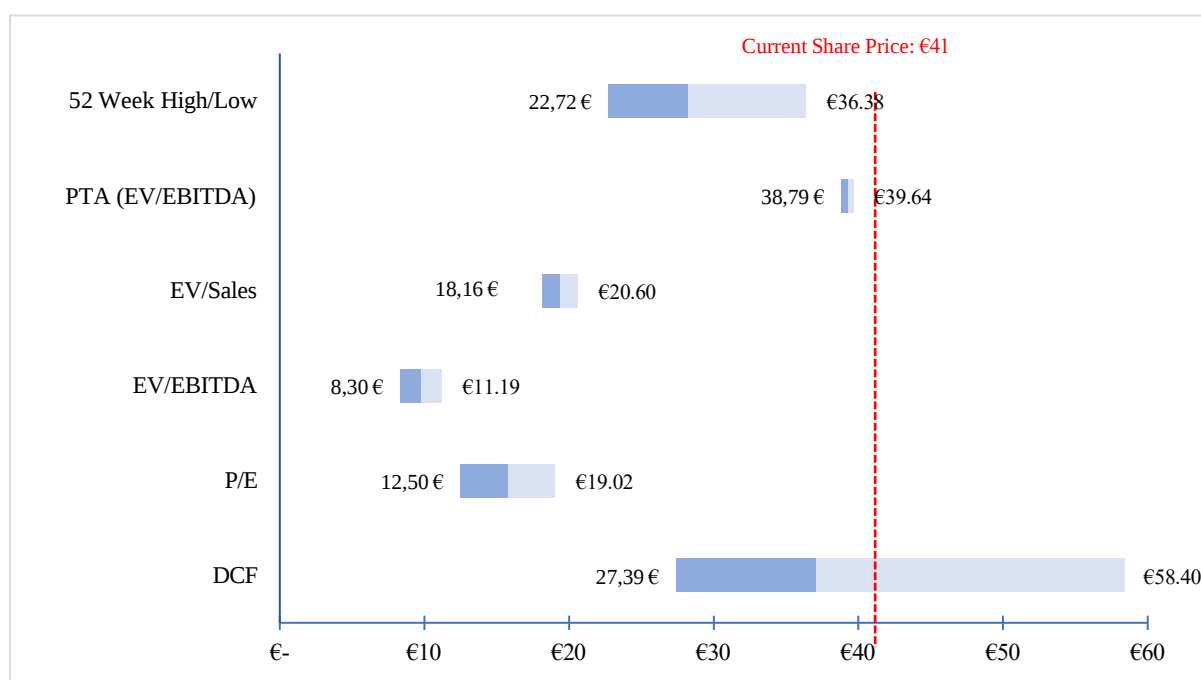
Announcement Date	Target Name	Acquirer Name	Announced Total Value	Payment Type	TV/EBITDA
Lasers					
11/09/2018	Finisar Corp	II-VI Inc	2 327	Cash or Stock	49,34x
2/23/2016	Newport Corp	MKS Instruments Inc	1 141	Cash	16,61x
3/16/2016	Rofin-Sinar Technologies Inc	Coherent Inc	836	Cash	12,76x
10/30/2018	Electro Scientific Industries Inc	MKS Instruments Inc	801	Cash	7,02x
Median			989		14,69x

Lighting					
12/21/2018	iGuzzini Illuminazione SpA	Fagerhult AB	370	Cash and Stock	24,77x
4/27/2017	Lumenpulse Inc	Power Corp of Canada, Management Group	365	Cash	44,72x
03/26/18	Shenzhen Changfang Group Co Ltd	n.a.	92	n.a.	14,76x
2/14/2018	CCS Inc/Japan	Optex Group Co Ltd	70	Stock	15,05x
08/08/2017	Cyalume Technologies Holdings Inc	Arsenal Capital Partners LP	49	Cash	6,05x

Median	92	15,05x
Highest	2 327	49,34x
Lowest	49	6,05x
Mean	673	21,23x
Median	370	15,05x
Median (excluding outliers, i.e. TV/EBITDA above 40x)	370	14,76x

Implied Valuation (EV/EBITDA)	All Precedent Transactions	Excluding Outliers
Median EV/EBITDA Multiple	15,1x	14,8x
OSRAM Forecasted EBITDA FY2019	283	283
OSRAM EV	4 253	4 171
OSRAM Net Debt	424	424
OSRAM Equity Value	3 829	3 747
OSRAM Shares (in million)	97	97
Target Per Share Price (€)	39,64	38,79

Appendix 22 OSRAM Valuation Summary



Appendix 23 Synergies Discount Rate Assumptions

Assumptions:		Notes:
D/V AMS (Historical)	21%	Average 5Y D/V Adjusted 5Y Beta (using SMI Index); sourced from Bloomberg Corporation Tax rate of 25%, adjusted for recurring Tax incentives for R&D, as well as previous Unrecognized Tax Losses
Beta_e (historical)	1,28	
Tax Rate	21,4%	
Beta_u AMS	1,06	
Beta_u OSRAM	0,88	
AMS Equity Value	2 709	Based on CCA
OSRAM Equity Value	3 582	Based on DCF
Value of the Combined Firm	6 290	
B_u Combined Firm	0,96	Weighted Average B_u based on each company's individual valuation
D/V Target	30,2%	AMS is targeting a credit Rating in the "BB area "for the bond issuance
Beta_d	0,17	
Beta_e	1,28	
Risk free rate	1,1%	Switzerland Risk Free Rate; Sourced from Market Risk Premium and Risk-Free Rate Used for 69 Countries in 2019: A Survey
Equity Risk Premium	6,2%	Switzerland MRP; Sourced from Market Risk Premium and Risk-Free Rate or 69 countries in 2019: A Survey
Tax Rate	21,4%	Corporation Tax rate of 25%, adjusted for recurring Tax incentives for R&D, as well as previous Unrecognized Tax Losses
Cost of Debt (Pre Tax)	2,15%	
Cost of Equity	9,06%	
Discount Rate	6,83%	

Appendix 24 AMS Historical D/V and Tax Analysis

D/V Historical Analysis (AMS) <i>in millions of EUR, unless stated otherwise</i>	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	YTD 2019
LT Debt	59	146	200	364	672	1 599	1 703
Interest Expenses	2	2	3	5	13	35	16
# of Shares Outstanding EoY (in million)	67	68	69	69	82	82	81
Share Price EoY (in €)	88,18 €	30,15 €	31,06 €	26,94 €	75,57 €	20,91 €	40,78 €
Market Capitalization	5 929	2 052	2 139	1 869	6 180	1 717	3 306
Debt/Value	0,99%	6,65%	8,57%	16,31%	9,80%	48,22%	34,00%

Effective Tax Rate Historical Analysis <i>in millions of EUR, unless stated otherwise</i>	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	YTD 2019
Income before income taxes	63	104	159	67	74	91	160
Tax Incentives for R&D	1	2	2	4	3	3	3
Income taxes	-3	-7	-10	6	15	2	-4
Effective Tax Rate	4%	6%	6%	-8%	-20%	-2%	2%
<i>Tax Incentives for R&D as %</i>	<i>2%</i>	<i>2%</i>	<i>1%</i>	<i>6%</i>	<i>4%</i>	<i>3%</i>	<i>2%</i>

Appendix 25 AMS Valuation according to CCA

Company:	Criteria for exclusion:
INFINEON TECHNOLOGIES AG SKYWORKS SOLUTIONS INC NXP SEMICONDUCTORS NV ANALOG DEVICES INC	-Market Capitalization significantly above \$8bn
GLOBAL MIXED-MODE TECHNOLOGY WELTREND SEMICONDUCTOR INC NIKO SEMICONDUCTOR CO LTD GOLDEN LONG TENG DEVELOPMENT SILICON TOUCH TECHNOLOGY INC MACROBLOCK INC ADVANCED ANALOG TECHNOLOGY ANPEC ELECTRONICS CORP ADVANCED POWER ELECTRONICS LEADTREND TECHNOLOGY CORP SOLITRON DEVICES INC ANALOG INTEGRATIONS CORP	-Market Capitalization significantly below \$1bn
POWER INTEGRATIONS INC	-EV/EBITDA multiple of 33,79x is a clear outlier
MONOLITHIC POWER SYSTEMS INC	-EV/EBITDA multiple of 49,97x is a clear outlier

in millions of CHF unless stated otherwise Company	Market Valuation		LTM Financial KPIs					LTM Profitability Margins (%)				Coverage Ratios				EV/Revenues	EV/EBITDA	EV/EBIT	EV/FCF	P/E	P/FCF
	Market Capitalization	Enterprise Value (EV)	Revenue	Gross Profit	EBITDA	EBIT	Net Income	Gross Profit	EBITDA	EBIT	Net Income	D/E	Debt/EBITDA	Debt/EBITDA	Net Debt/EBITDA						
ELMOS	529	449	290	133	85	54	42	45%	29%	19%	15%	13%	,80x	,10x		1,55x	5,26x	8,27x	,00x	12,48x	,00x
SEMICONDUCTOR SE	7 869	10 671	5 831	2 213	1 361	833	596	37%	23%	14%	10%	36%	2,06x	1,39x		1,83x	7,84x	12,81x	22,55x	13,20x	16,63x
ON SEMICONDUCTOR	3 227	3 154	624	384	162	113	63	62%	26%	18%	10%	7%	1,31x	,41x		5,06x	19,47x	27,88x	27,44x	50,93x	28,08x
SEMTECH CORP	2 793	2 800	627	281	187	138	116	40%	30%	22%	18%	2%	,24x	,00x		4,46x	14,99x	20,32x	38,24x	24,17x	38,15x
MELEXIS NV	3 109	2 776	1 174	592	179	100	89	52%	15%	8%	8%	0,00%	,00x	,24x		2,36x	15,52x	27,82x	12,81x	34,93x	14,35x
CIRRUS LOGIC INC	2 647	2 412	398	205	71	47	62	51%	18%	12%	16%	0,24%	,09x	,28x		6,06x	33,79x	51,05x	59,25x	42,42x	65,03x
POWER INTEGRATIONS INC	6 716	6 301	589	326	126	112	109	55%	21%	19%	18%	0,03%	,02x	,27x		10,70x	49,97x	56,22x	57,48x	61,87x	61,26x
MONOLITHIC POWER SYSTEMS INC	7 869	10 671	5 831	2 213	1 361	833	596	61,87%	29,75%	21,94%	18,43%	35,65%	2,06x	1,39x		10,70x	49,97x	56,22x	59,25x	61,87x	65,03x
Highest	529	449	290	133	71	47	42	37,05%	15,23%	8,50%	7,58%	0,00%	,00x	,28x		1,55x	5,26x	8,27x	,00x	12,48x	,00x
Lowest	3 841	4 080	1 362	591	310	200	154	48,80%	23,31%	16,08%	13,59%	8,15%	,65x	,10x		4,57x	20,98x	29,20x	31,11x	34,29x	31,93x
Mean	3 109	2 800	624	326	162	112	89	50,99%	23,33%	18,17%	14,63%	1,64%	,24x	,41x		4,46x	15,52x	27,82x	27,44x	34,93x	28,08x
Median																					

Implied Valuation (P/E)		All	Most Similar Companies
Median P/E Multiple		16,5x	34,9x
AMS EPS 2019		1,14	1,14
Target Per Share Price (€)		18,80 €	39,82 €

Implied Valuation (EV/EBITDA)	All	Most Similar Companies
Median EV/EBITDA Multiple	10,9x	15,5x
AMS EBITDA (CHF)	231	231
Exchange Rate EUR/CHF @30/09/2019	0,92	0,92
AMS EV	2 323	3 301
AMS Net Debt	974	974
AMS Equity Value	1 349	2 327
AMS Shares	83	83
Target Per Share Price (€)	16,26 €	28,04 €

Implied Valuation (EV/Sales)	All	Most Similar Companies
Median EV/Revenues Multiple	1,9x	4,5x
AMS Revenues	1 603	1 603
Exchange Rate EUR/CHF @30/09/2019	0,92	0,92
AMS EV	2 738	6 580
AMS Net Debt	974	974
AMS Equity Value	1 764	5 606
AMS Shares	97	97
Target Per Share Price (€)	18,26 €	58,03 €

Appendix 26 Synergies Free Cash flows Projections

Year	FY 2019 (E)	FY 2020 (E)	FY 2021 (E)	FY 2022 (E)	FY 2023 (E)	FY 2024 (E)	FY 2025 (E)	FY 2026 (E)	FY 2027 (E)	FY 2028 (E)	FY 2029 (E)
Initial Date	01/10/2018	01/10/2019	01/10/2020	01/10/2021	01/10/2022	01/10/2023	01/10/2024	01/10/2025	01/10/2026	01/10/2027	01/10/2028
Final Date	30/09/2019	30/09/2020	30/09/2021	30/09/2022	30/09/2023	30/09/2024	30/09/2025	30/09/2026	30/09/2027	30/09/2028	30/09/2029
Period	0	1	2	3	4	5	6	7	8	9	10
Days in Period		366	365	365	365	366	365	365	365	366	365
Synergies Schedule:											
Revenues	0%	33%	66%	100%	100%	100%	100%	100%	100%	100%	100%
Cost Savings:											
COGS	0%	33%	66%	100%	100%	100%	100%	100%	100%	100%	100%
OPEX	0%	33%	66%	100%	100%	100%	100%	100%	100%	100%	100%
Integration Costs	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Synergies Cashflows:											
Revenues	0	20	40	60	60	60	60	60	60	60	60
Cost Savings:											
COGS	0	40	79	120	120	120	120	120	120	120	120
OPEX	0	40	79	120	120	120	120	120	120	120	120
Integration Costs	-400	0	0	0	0	0	0	0	0	0	0
Additional EBITDA	-400	99	198	300	300	300	300	300	300	300	300
(-) Taxes @ 21,4%	86	-21	-42	-64	-64	-64	-64	-64	-64	-64	-64
(=) Unlevered FCF	-314	78	156	236	236	236	236	236	236	236	236
Discounted FCF	-314	73	136	193	181	169	159	148	139	130	122

Appendix 27 DCF Analysis Synergies Valuation Summary

Intrinsic Value of synergies:	
Sum of Discounted FCF	1 137
Terminal Value	1 781
Enterprise Value	2 918
Nr. Of Basic Shares outstanding (in millions)	97
Synergies Value Per Share Price (€)	30,20

Appendix 28 Sensitivity Analysis to the valuation of synergies to changes in the WACC and the share of synergies realized

		% of Synergies Achieved											
		10%	20%	25%	30%	40%	50%	60%	70%	75%	80%	90%	100%
Discount Rate	5,83%	0,70	4,66	6,63	8,61	12,57	16,52	20,48	24,43	26,41	28,39	32,34	36,30
	6,08%	0,53	4,31	6,21	8,10	11,88	15,67	19,45	23,23	25,13	27,02	30,80	34,59
	6,33%	0,37	4,00	5,81	7,62	11,25	14,88	18,50	22,13	23,94	25,76	29,38	33,01
	6,58%	0,23	3,71	5,45	7,19	10,67	14,15	17,63	21,11	22,85	24,59	28,07	31,55
	6,83%	0,09	3,44	5,11	6,78	10,13	13,47	16,82	20,17	21,84	23,51	26,86	30,20
	7,08%	-0,03	3,19	4,80	6,41	9,63	12,85	16,07	19,29	20,90	22,51	25,73	28,95
	7,33%	-0,15	2,95	4,50	6,06	9,16	12,26	15,37	18,47	20,02	21,58	24,68	27,78
	7,58%	-0,26	2,73	4,23	5,73	8,72	11,72	14,71	17,71	19,21	20,70	23,70	26,69
	7,83%	-0,36	2,53	3,98	5,42	8,32	11,21	14,10	16,99	18,44	19,89	22,78	25,67
	8,08%	-0,46	2,34	3,74	5,14	7,93	10,73	13,53	16,32	17,72	19,12	21,92	24,72
	8,33%	-0,55	2,16	3,51	4,87	7,57	10,28	12,99	15,70	17,05	18,40	21,11	23,82
	8,58%	-0,63	1,99	3,30	4,61	7,24	9,86	12,48	15,10	16,41	17,73	20,35	22,97
	8,83%	-0,71	1,83	3,10	4,37	6,92	9,46	12,00	14,54	15,82	17,09	19,63	22,17
	9,08%	-0,79	1,68	2,91	4,15	6,61	9,08	11,55	14,02	15,25	16,48	18,95	21,42

Appendix 29 Range of Offer Prices for OSRAM as a function of synergies paid to the target shareholders and share of synergies achieved

OSRAM Valuation		38,14			
Offer Price (€/share)		Share of Synergies Achieved			
		100%	75%	50%	25%
Share of Synergies to be paid to OSRAM's shareholders	100%	68,35	59,98	51,62	43,25
	90%	65,33	61,91	50,27	42,74
	80%	62,31	59,27	48,92	42,23
	70%	59,29	56,63	47,58	41,72
	60%	56,27	53,99	46,23	41,21
	50%	53,25	51,35	44,88	40,70
	40%	50,23	48,71	43,53	40,19
	30%	47,21	46,07	42,19	39,68
	20%	44,19	43,43	40,84	39,17
	10%	41,17	40,79	39,49	38,66
	0%	38,14	38,14	38,14	38,14