PITT STREET RESEARCH

BluGlass Ltd.

All systems go

Share Price: A$0.057

ASX: BLG

Sector: Technology

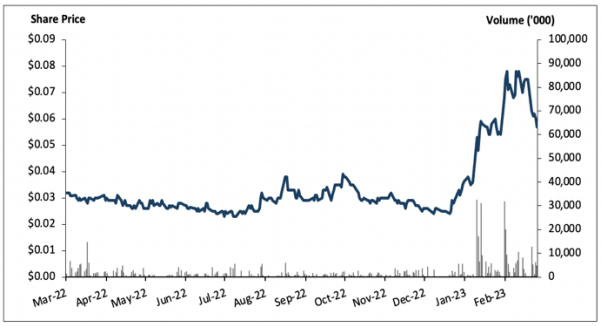
20 March 2023

BluGlass (ASX:BLG) is growing customer orders for its first suite of gallium nitride (GaN) lasers. Following product launches at Photonics West in San Francisco in January, several industry-leading customers have purchased, including OEMs in the quantum and industrial segments, and a world-leading energy research institution. All customers are qualifying BLG's products within their own applications. Once qualified, BLG expects to secure recurring large-volume orders from these customers as well as orders from new customers. BLG is now well-funded to expedite revenue generation having completed a $10.2m capital raise to global institutional and sophisticated investors.

Market cap. (A$ m)	85.0
# shares outstanding (m)	1,490.7
# shares fully diluted (m)	1,671.1
Market cap ful. dil. (A$ m)	95.3
Free float	100.0%
12-months high/low (A$)	0.078 / 0.023
Avg. 12M daily volume ('1000)	2,306.7
Website	www.bluglass.com.au

Source: Company, Pitt Street Research

Share price (A$) and avg. daily volume (k, r.h.s.)



Source: Refinitiv Eikon, Pitt Street Research

Flexibility is key

BLG has six products in market, spanning violet and blue wavelengths in both single-mode and multi-mode devices. The range enables BLG to serve a diverse range of customers with different end-uses. BLG's GaN lasers are suitable for several end markets such as machine vision, 3D printing and 3D imaging, quantum sensing and computing, material sensing and flow cytometry, all of which require visible lasers of different power and precision needs.

Validating Fremont

BLG acquired a semiconductor fabrication facility in Fremont, California, in April last year, pivoting from outsourced contract manufacturing. BLG is already reaping the benefits of in-house manufacturing, significantly fast-tracking its development and commercialisation progress, achieving several key operational milestones, and enabling the launch of commercial products. The company demonstrated feasible reliability of over 500 hours back in November with its lasers meeting or exceeding performance benchmarks from contract manufacturers during testing. These steps significantly de-risk BLG's technical and commercialisation roadmaps and validates the decision to shift manufacturing to an in-house model.

Valuation of US$216.2m/A$324.9m ($0.20/share)

With BLG securing first sales, we believe it is the right time to value the company. We value BLG at US$219.2m or A$324.1m at current exchange rates, using an M&A model. This equates to A$0.20 per share. Please see pages 13-15 for more on the valuation rationale and the key risks.

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Technical and commercial achievements

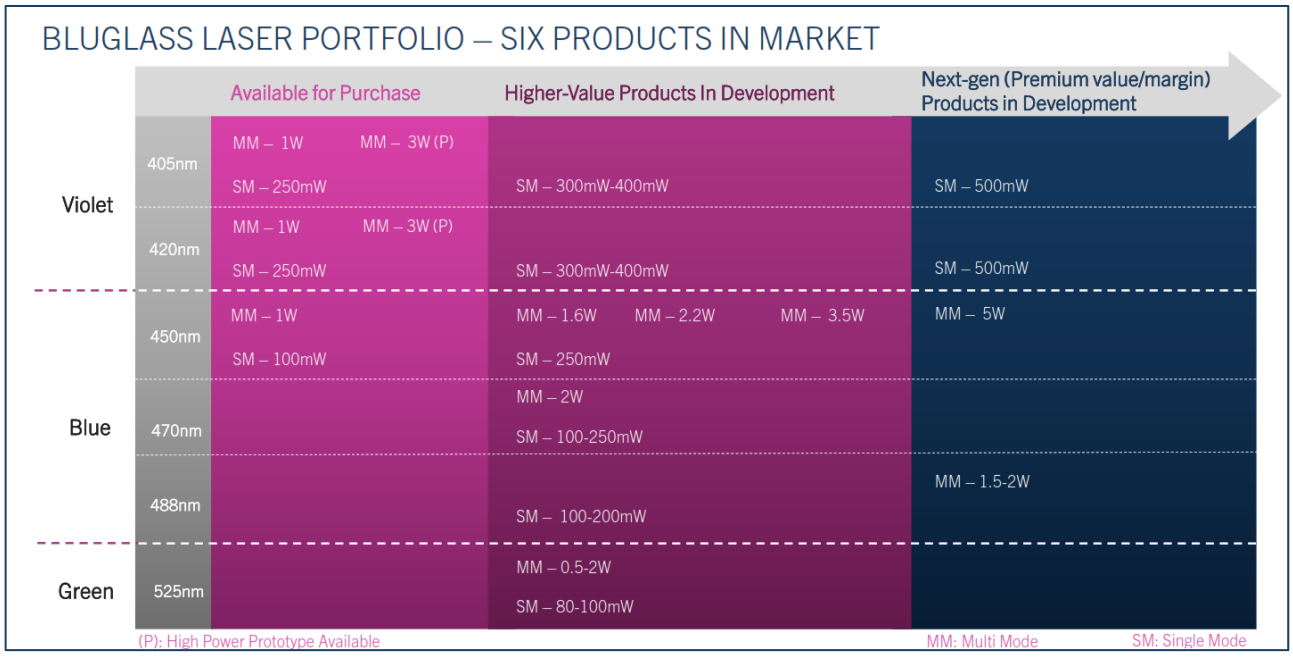
BluGlass launches first products and secures inaugural orders

In January 2023, BLG launched its first suite of gallium nitride (GaN) laser products for customer purchase.

In January 2023, BLG launched its first suite of gallium nitride (GaN) laser products for customer purchase at the SPIE Photonics West conference in San Francisco. The following six products (Figure 1) are now available for purchase:

- Violet 405nm multi-mode 1W laser
- Violet 405nm single-mode 250mW laser
- Violet 420nm multi-mode 1W laser
- Violet 420nm single-mode 250nW laser
- Blue 450nm multi-mode 250mW laser
- Blue 450nm single-mode 100mW laser

Figure 1: BluGlass' product suite



Source: Company

Purchase orders secured, more to come

BLG secured initial purchase orders of across its gallium nitride (GaN) laser product suite from four customers, including leading OEMs in the quantum and industrial segments.

Two weeks following product launches at Photonics West, BLG started securing initial purchase orders of its GaN lasers with sales spanning its 405nm, 420nm and 450nm single and multi-modes devices. Customers include leading original equipment manufacturers (OEMs) and organisations in the quantum, scientific, energy and industrial segments. Customers will use these first products to qualify BLG's lasers within their own applications.

Although revenues from these initial low-volume orders are immaterial, the company expects recurring larger-volume orders from these customers once the lasers are qualified: which essentially means tested in these customers' products. Qualification is a standard validation process in the semiconductor and laser industry.

BLG also expects new customers to follow suit, given the strong interest it received at Photonics West and whilst developing its GaN lasers. There is a

need for dedicated GaN laser suppliers in an emerging and rapidly growing market segment, in particular one that can provide greater manufacturing agility and form factor flexibility, enabling customers to expand their product offerings and create new applications. BLG's single-mode 250mW lasers are demonstrating very strong performance, and are significantly higher-spec than the company anticipated releasing (as recently as October 2022) with the company then predicting a 100-200mW product launch. Additionally, the 1W multi-mode (MM) products released are on par with the relevant 1W class products available in the market. Applications that BLG's products could service include machine vision, 3D printing and 3D imaging/mapping, quantum sensing and computing, material sensing and flow cytometry, amongst others.

BLG's product suite caters to unmet needs

The existing large players do not provide sufficient form factor flexibility and supply in several wavelengths is constrained.

The company is providing customers with easier to use lasers by offering products in flexible packaging types (called form factors) in both common and underserved wavelengths, and in different modes (Figure 2). The existing large players do not currently provide sufficient form factor flexibility[1] and supply in several wavelengths is constrained. Consequently, end-customers need to undertake significant post-purchase packaging customisation.

BLG is looking to address these unmet needs and is developing product offerings with potential customers in several of its target segments. The company aims to provide plug-and-play lasers along with customised solutions to the market.

Figure 2: BluGlass is designing its product offering to solve customer challenges

Source: Company

[1] Form factors refer to the shape, size, interface and other physical components of the laser. It also includes how the laser electrically and physically connects to a system, and whether the light is delivered through a fiber, or straight from the emitter itself.

Advantages of GaN laser diodes

Both violet and blue diodes are ideal for alignment and sensing applications, but each has their own unique light emission abilities and end uses.

GaN laser diodes span the visible wavelengths from the violet to green spectrum. BLG's first six products are either violet or blue laser diodes. Both are ideal for alignment and sensing applications, but each has their own unique light emission abilities and end applications.

Visible laser diodes have many inherent advantages over traditional infrared laser applications, including superior brightness and higher energy absorption in metals, combined with more accurate, cleaner, faster materials processing – essential for today's increasingly miniaturised high-tech applications. There are many key markets where GaN laser diodes are disrupting the very large (estimated to be worth over US $25B by 2025) infrared laser market due to their unique performance advantages.

Industrial manufacturing

Blue laser diodes are highly beneficial for additive manufacturing, machine vision, and importantly gold and copper cutting and welding (used in high-tech manufacturing of mobile phones and semiconductors) compared to the widely used high-power infrared (IR) laser diodes. Blue laser wavelengths have excellent absorption by key industrial metals, including copper or gold, whereas IR beams are largely reflected (up to 95%) by these metals.

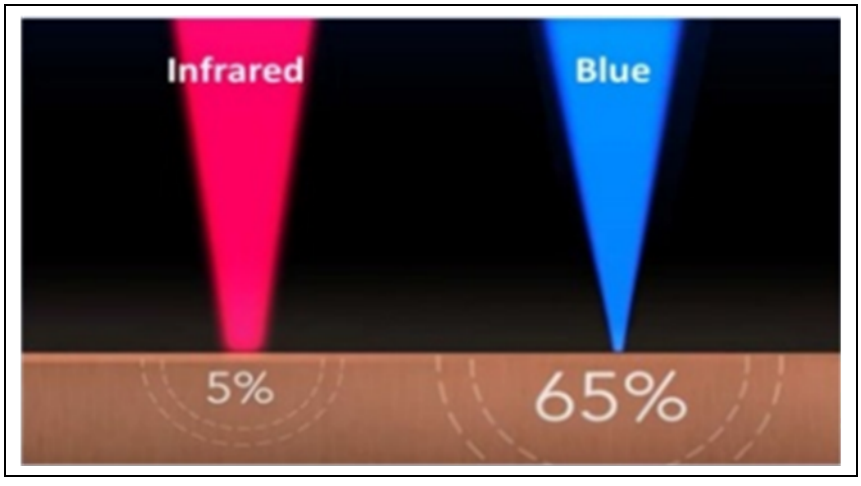
As an example, an IR laser needs almost 10-15 times the output power of a blue laser diode to facilitate similar materials processing. Additionally, blue laser diodes can help to smooth welding seams and thereby greatly enhance weld shapes and product qualities, while also enabling new products, not possible with IR lasers.

Automotive applications

Blue laser diodes have been well accepted in automotive applications because of their higher optical power, enhanced efficiency, wider temperature range and longer lifetime compared to those of historic products.

Blue industrial lasers provide stable and high output power required for metal processing applications, including welding of lithium batteries for cars and large-scale renewable energy storage, as well as sensing and LiDAR applications (Figure 3).

Figure 3: Infrared versus blue absorption



Source: Nuburu

Optical communication

Laser diodes have enormous potential for high-speed communication (e.g., 5 Gbit per second error free data transmission) in free space, underwater or in fiber applications. The compact laser beam can be modulated at a very high speed and is highly suited for defence and security applications.

Conventional underwater acoustic communications are very slow and not suitable for long-range applications. They can also be easily intercepted. Laser-based, high-speed communications using high power laser arrays or bars will solve these problems, allowing quantum encrypted, long-range communications.

Medical applications

In opto-genetics, blue, green and red laser diodes can stimulate or inhibit the response of nerve cells depending on their photon energy. Since these laser beams can be focused or narrowed to a very narrow width, they can be integrated with neuro-probes and can provide new avenues for medical diagnosis and treatment.

Additionally, high power single mode GaN laser diodes are being employed in highly delicate retinal and blood vessel surgery.

Quantum sensing and computing applications

Single-mode and Distributed Feedback (DFB) lasers are being developed for special applications requiring high spectral purity, such as quantum sensing, quantum computing, atomic clocks or filtered free space transmission systems. These will be highly advantageous in future computing and autonomous vehicle applications for pinpoint time/space location accuracy compared to GPS navigation.

Displays (AR and VR)

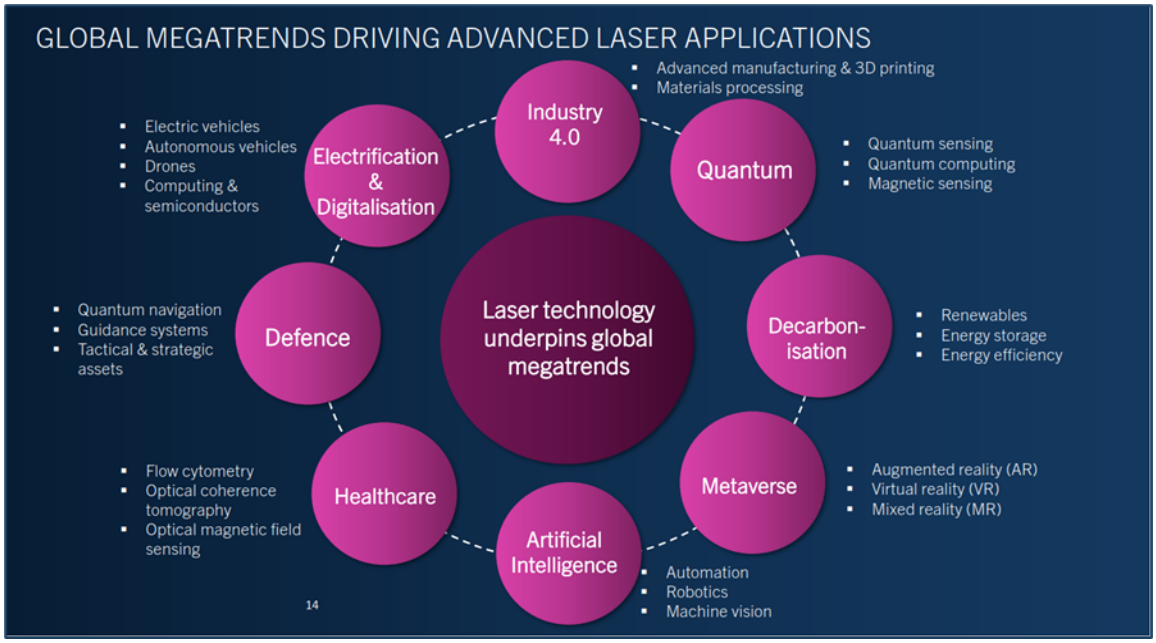
Like LEDs, high power blue laser diodes are being developed for use in augmented and virtual reality applications. Red-green-blue (RGB) applications are highly desirable for this purpose in the industry. When all three colours are combined in a single device, it creates the ability to display over 16 million colours. Because each of these base colours has over 250 different shades, when you mix and blend these primary shades, it provides over 16 million distinct colours.

Other applications

Due to various advantages as discussed above, GaN-based laser diodes have found applications in bio-chemical analysis, general lighting, full-colour displays, laser-based TVs, sensing, portable projection, laser processing, laser pumping and laser lithography. We believe they will continually attract creative people from various fields to exploit the unique properties for novel applications.

GaN laser adoption is growing rapidly and is being driven by several global megatrends (Figure 4). These include quantum applications, the metaverse, artificial intelligence and decarbonisation.

Figure 4: Global megatrends are driving the adoption of GaN lasers



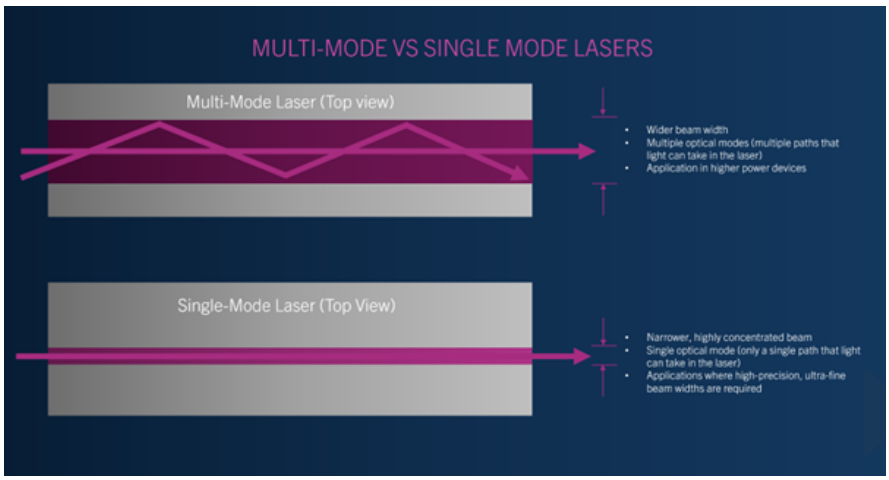
Source:Company

Single mode and multi-mode applications

The key different between single-mode and multi-mode laser applications are that there is only one mode in the output beam of a single-mode laser, while there are multiple modes in the output beam mode of a multi-mode laser.

The key difference between **single-mode** and **multi-mode** laser applications is that there is only one mode in the output beam of a single-mode laser, while there are multiple modes in the output beam of a multi-mode laser (Figure 5).

Figure 5: Single-mode and multi-mode lasers



Source: Company

Multi-mode lasers tend to be used for higher-power, lower precision applications where the light does not to be in the same phase or have narrow beam width, such as industrial cutting and welding. These applications require more power, either to travel long distances (such as sending Lidar signals through water) or to disintegrate sturdy material (such as during laser welding or cutting).

Conversely, single-mode lasers are used for applications where ultra-high precision is required, and the light needs to be concentrated. Examples include quantum sensing or biotech sensing applications, where a single atom needs to be targeted. These applications need only a fraction of the power of multi-mode lasers and BLG's 250mW single-mode lasers are considered 'high-power' for single-mode.

Incumbents typically offer few wavelengths and limited form factors, called TO-Cans or Chip-on-Submounts. These can be costly and bulky for customers to integrate into their product specifications, if at all possible. This is particularly the case when several TO-Cans are needed, due to power requirements.

More products progressing through BLG's supply chain

BLG's portfolio is not yet as extensive as its competitors, but will continue to grow in the years ahead. We see three opportunities for BLG to pursue in the medium to long term. First, the launch of higher-powered lasers beyond 1W. BLG had two higher-power 3W prototype devices showcased at Photonics West – its 405nm and 420nm 3W lasers, which are available to purchase as alpha products for customer testing.

Second, the potential to extend the company's wavelength range to green laser diodes. High-power green lasers are very difficult for the incumbent manufacturing technology MOCVD, as the high manufacturing temperatures limit the quality of the essential green enabling material – indium - in the laser diode. Production of green laser diodes has been a long-term ambition of BLG's but will become possible as the company leverages its proprietary low temperature manufacturing process - Remote Plasma Chemical Vapour Deposition (RPCVD).

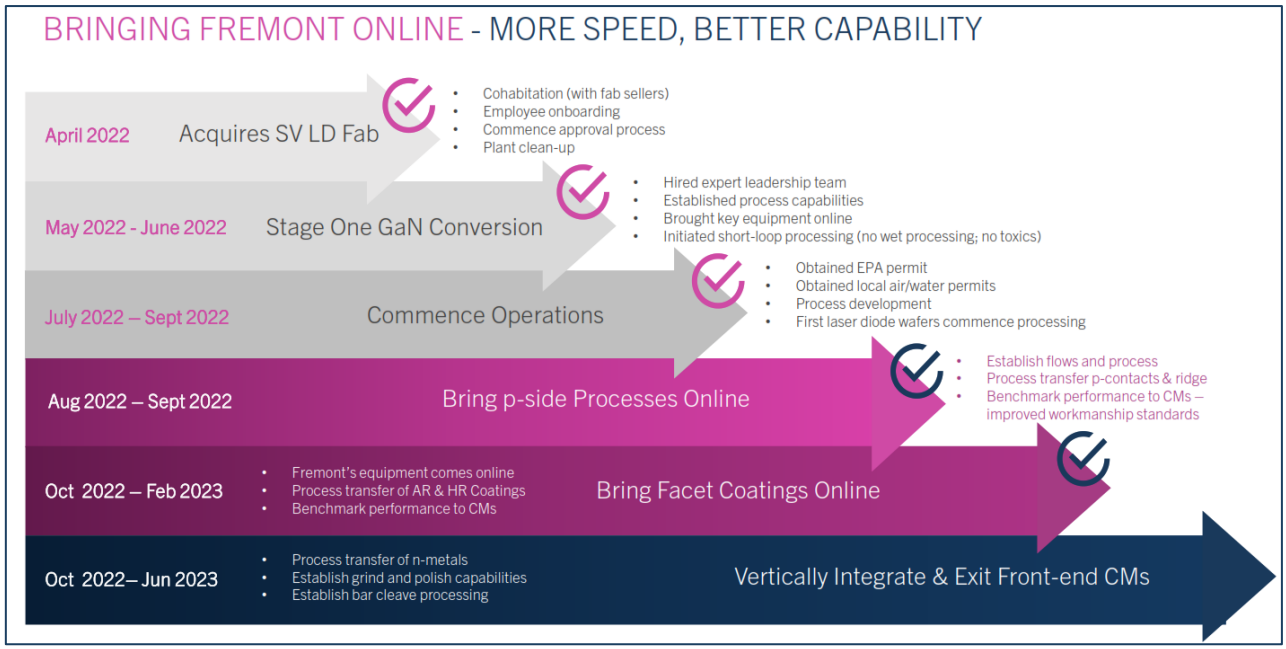
Third, the potential for Distributed Feedback (DFB) lasers. DFB lasers emitting at a single wavelength are being developed for special applications requiring high spectral purity, such as atomic clocks or filtered free space transmission systems. These will be highly advantageous in autonomous vehicle applications for pinpoint time/space location accuracy compared to GPS navigation. BLG received strong interest in its novel laser paper on DFB lasers grown with RPCVD at Photonics West. DFB lasers are not commercially available in GaN material today.

BLG's unique technology advantages

Fremont fab lasers exceed expectations

Since BLG acquired the Fremont fab in April 2022, the company has made significant progress towards its goal of vertical integration (Figure 6). The company has gradually transitioned capacity over to Fremont and secured all necessary permits to operate the facility. In 1H CY23, BLG will formally bring the remaining equipment online, transfer coatings and metals in-house from contract manufacturers, and establish several downstream capabilities including bar cleave, polishing and grinding. The company is targeting vertical integration by the end of FY23 – in other words, exclusive in-house manufacturing.

Figure 6: BluGlass' progress with Fremont fab



Source: Company

BLG's GaN laser diodes produced at its Fremont fab are achieving or exceeding contract manufacturer performance benchmarks.

In mid-January, BLG revealed the GaN laser diodes produced at its Fremont fab were achieving or exceeding contract manufacturer performance benchmarks. This was an important step for the company and has validated its decision to acquire Fremont. The technical milestone significantly de-risks the company's technology and commercialisation roadmaps.

Jim Haden appointed CEO

On 1 March, BLG appointed President Jim Haden to the role of Chief Executive Officer. An industry veteran, Mr Haden joined BLG as President in September 2021.

Under his leadership, the company has made significant technical and commercial in-roads. As President, he has significantly improved laser performance and reliability, successfully launched BLG's first suite of products and secured initial customer orders. He was instrumental in the acquisition of the Fremont production fab, which is enabling BLG to vertically integrate its downstream manufacturing processes, expedite development and production, while reducing manufacturing costs.

Mr Haden has more than three decades' laser expertise and previously held senior leadership positions at several of BLG's potential customers and competitors, including Kyocera SLD, nLight, Coherent and JDS Uniphase (now Lumentum). He brings to BLG a proven track record transitioning advanced technology businesses to profitable, high-growth commercial entities.

Industry overview

The company is primarily targeting the industrial, scientific and biotech verticals. These three verticals are expected to grow to US$735m by 2025.

BLG's target markets

GaN laser diodes are advanced semiconductor devices used in a wide range of industries and applications. The company is primarily targeting the industrial, scientific, and biotech verticals, which focus on applications such as industrial cutting and welding for high tech applications, 3D printing, quantum computing and medical diagnostics. These three verticals are expected to grow to US$735m by 2025 (Figure 7 on page 11).

As one of just a handful of players globally, BluGlass is targeting sales to large OEM's such as Coherent, IPG Photonics, Trumpf, nLight, Nuburu; electronics and consumer goods manufacturers such as Apple, Mitsubishi, Samsung, Meta, LG, Google; as well as defence contractors such as Boeing, Lockheed Martin, and Northrop Grumman.

Figure 7: GaN Laser Market Verticals BluGlass is targeting are expected to reach US $735m by 2025

Source: Company

Comparable companies

For a comparable set of companies, we have looked at public companies listed on the ASX with a focus on developing semiconductor technology. We also revisit BLG's three main competitors.

ASX listed companies

Weebit Nano (ASX:WBT) is developing ReRAM technology - a newly emerging computer memory technology that combines the best of today's mainstream storage technologies, i.e. DRAM and Flash memory. It will achieve volume production and commercialisation throughout CY23, beginning with customers of US semiconductor fab SkyWater (NASDAQ:SKYT).

Silex Systems (ASX:SLX) is an Australian technology company focused on the commercialisation of innovative laser enrichment technology for uranium production and enrichment for nuclear power applications and silicon enrichment for silicon quantum computing. The company raised A$120m last month and hopes to begin a commercial pilot demonstration in CY23. Full commercial operations are not expected until c.CY27-28, albeit up to three years earlier than had been planned prior to the capital raising.

Archer Materials (ASX:AXE) is an Australian materials technology company developing advanced semiconductor devices and processor chips related to quantum computing and medical diagnostics. The company is still at the R&D phase and is arguably some years away from commercial revenue.

4DS Memory (ASX:4DS) is aiming to provide an enterprise grade storage memory for cloud and data centre storage markets. The company is developing a proprietary Interface Switching ReRAM technology and has 34 American patents. It has a joint development agreement with Western Digital subsidiary HGST. The company is some way behind BLG, having had a number of setbacks since the pandemic, such as manufacturing disruptions due to

lockdowns and less than ideal endurance test results. It is only aiming to have manufacture and analysis of its latest Platform Lot in this calendar year.

Revasum (ASX:RVS) provides grinding, polishing and CMP equipment to semiconductor substrate and device manufacturers. The company expects demand for such devices to grow 35-40% per year over the next five years as EVs replace the bulk of the world's internal combustion engine vehicles. Although Revasum has commercialised its technology, the company has been impeded by the lack of long-term stability in its leadership, currently with its third CEO in less than five years, and it has struggled with cash burn issues.

BLG's direct competitors

BluGlass only has a handful of global competitors serving a rapidly growing market segment:

Nichia developed the world's first high luminous blue LED, becoming the global pioneer in the blue LED and laser diode domain.

Subsequently, it developed the world's first white LED by combining yellow phosphor and blue LEDs. Diversification in wavelength range and enhancement in optical output power have further enabled Nichia to successfully develop GaN-based laser diodes. Nichia has created violet laser diodes with pulsed operation and continuous wave operation. Nichia has since expanded its emission wavelength region to the visible blue and green regions.

The invention of nitride-based LED and laser diodes by Nichia has resulted in technological innovation of light sources in areas such as display, general lighting, automotive, industrial equipment and medical devices. Among these areas, Nichia is focussed on the high-volume, low-mix display segment.

OSRAM offers top-quality solutions in sensor technology and laser systems with its expertise ranging from semiconductor technologies to individual customer applications. OSRAM's Semiconductors Automotive business is a global leader in automotive LED lighting for exterior and interior lighting applications.

Its Semiconductors Consumer business supplies sophisticated sensing and optical solutions used in smartphones and consumer devices. OSRAM also provides blue multi-mode laser diodes for industrial and automotive applications. Furthermore, OSRAM's product portfolio includes green laser diodes (used in pico projectors).

Kyocera SLD (KSLD) was formed in 2021 with Kyocera's acquisition of SLD laser. KSLD is engaged in the commercialisation of revolutionary semi-polar GaN substrate technology for high-brightness laser light for display and automotive applications. Laser light sources are used directly in single colour and red-green-blue applications or embedded in phosphor architectures pumped by lasers. The laser light technology has been invented and commercialised by KSLD through the combination of high brightness outputs from blue laser diodes and a phosphor wavelength converter.

How does BLG compare to WBT?

BLG has some advantages over WBT including that BLG has just begun to generate revenues and it will retain a greater share of revenues than WBT.

Our readers may remember we most recently valued Weebit Nano (ASX: WBT), at $1.17BN (or $6.10 per share). BLG has some advantages over WBT including that BLG has begun to generate revenues and, due to its vertical integration and full-suite manufacturing capability it will retain a near 100% share of revenues, compared to WBT given that WBT operates with a licensing % of revenue model. In other words, BLG has operational control of its own destiny.

In WBT's favour is that it will serve larger verticals – at least for the next few years. We have noted that BLG's initial three verticals are expected to grow to US$735m in size by 2025. WBT's first target market alone (Embedded Non-Volatile Memory) is expected to be worth US$2.3bn by 2026[2], and (as we have noted in previous WBT reports) this is just the tip of the iceberg. However, two things should be noted. First, BLG may ultimately capture larger revenues given its models. And secondly, there is potential for GaN lasers to grow as a share of the entire global market for laser applications that, as we outlined in our initiation report on BLG, is worth US$25bn.

Ultimately, we think the main thing BLG investors can take away from the share price success of WBT is that early-stage semiconductor technology companies can substantially re-rate once they exit the R&D stage and move into commercialisation. We think BLG can become a market share player to create significant shareholder value as it qualifies its technology and consequently builds its customer numbers and revenues.

Valuing BLG

We have chosen to adopt an M&A approach, rather than a DCF for BLG.

We have chosen to adopt an M&A approach, rather than a DCF for BLG, because DCFs can be volatile for companies such as BLG that are at an early stage of commercialisation and when the pace is unpredictable. Furthermore, M&A is fairly common for early to mid-stage companies in the semiconductor industry. At the same time, deriving an appropriate M&A value is appropriate given that deals are done at very different prices and the companies are at different stages. There are also very few deals in the laser diode space specifically, although a handful of deals have taken place in the last couple of years.

Recent comparable deals

The photonics industry is highly acquisitive. Despite 2022 representing a major downturn in the number and scale of deals due to rising inflation, and companies investing in in-housing capabilities, there were 553 transactions in the photonics industry with a reported value of US$48bn with the median transaction value being US$26m. It should be noted that this figure includes not just M&A deals but also vertical integration activities, such as BLG's acquisition of the Fremont fab.

Recent M&A deals in the laser industry include **Kyocera's acquisition of GaN laser player SLD Laser** in January 2021. This was BLG CEO Jim Haden's last company before joining BLG. SLD Laser's speciality was GaN lasers for automotive, mobility, specialty lighting and consumer applications. Unfortunately, the terms of this deal are confidential.

[2] https://www.yolegroup.com/press-release/embedded-and-stand-alone-nvm-two-different-futures/

Infineon Technologies will acquire GaN Systems for US$830m, a deal that only closed on 2 March 2023. GaN Systems manufactures gallium nitride-based power switching semiconductors for power conversion and control applications. It is the most advanced of all companies we mention in this section, employing over 200 staff and having raised over US$170m in funding since its founding in 2009. Its revenues are not public information although business databases such as ZoomInfo and Growjo have made varying estimates ranging from US$20-US$40m a year. However, GaN Systems' target markets are quite different from BLG's - it makes power transistors rather than lasers. The GaN transistor market is currently smaller than the GaN laser market but is nonetheless predicted to reach US$2B by 2025.

Another deal is the June 2022 acquisition of **Danish fibre laser manufacturer NKT Photonics by Hamamatsu Photonics (TSE:6965)** for US$216.2m (A$314m). Considering that in the previous year, NKT achieved €80.1m in sales, or US$85.6m, this represented an EV/Sales multiple of ~2.5x. In the last 12 months this was one of only two M&A deals in the laser space of a company that had commercialised its technology.

In February 2022, **laser giant Lumentum (NDQ:LITE) announced it would acquire NeoPhotonics** the Californian based developer of silicon photonics and advanced hybrid PIC-based lasers, modules, and subsystems. Lumentum acquired the company for $16 per share in cash, representing an equity value of US$918 million.
Lumentum, which lost out on its bid to acquire Coherent earlier this year following multiple purchase agreements with the laser and laser components developer and manufacturer, will use the NeoPhotonics acquisition to accelerate its penetration into opportunities in high-speed optical components for cloud and telecom infrastructure — a more than $10 billion market.

Another majority-stake acquisition deal in the last 12 months was **the acquisition of Freedom Photonics by Luminar (NDQ:LAZR),** which was completed for US$31.3m. Freedom Photonics manufactures photonic components, modules and subsystems – essentially components, modules and subsystems for creating, manipulating and detecting light. It is only at the performance testing phase so it is only natural that it would attract a lower valuation.

One final deal we note is the **SPAC merger of NUBURU and Tailwind Acquisition Corp.** The combined company operates under the name Nuburu and trades on the NYSE under the ticker code BURU. Nuburu is a developer and manufacturer of industrial blue lasers. Their high-brightness and high-power design is intended to produce high-quality laser materials processing at a fast speed. Purposes include laser welding and additive manufacturing of copper, gold, aluminium and other industrially important metals. Nuburu's lasers can produce defect-free welds up to eight times faster than the traditional approaches, with flexibility inherent to laser processing. This deal valued the final company at US$350m.

Valuation of BLG US$216.2m / A$324.9m

We value BLG at US$216m/A$329.1m, using the NKT Photonics deal as precedent.

We have decided to use the NKT Photonics deal as a precedent for BLG because we think it is the closest comparable of all the companies above. Although BLG isn't generating revenues comparable to NKT yet, we think both companies' products are similar.

The US$216.2m deal is worth A$324.9m at the current exchange rate (US$1=A$1.5). With 1,671.1m shares on issue, this equates to a value of $0.20 per share (Figure 8 on page 15).

Figure 8: Valuation for BluGlass

Valuation	Amount
M&A valuation (US$m)	**216.2**
USD/AUD exchange rate	1.52
Enterprise Value (A$m)	**324.9**
Net debt (cash)	(8.4)
Equity value (A$m)	**333.3**
Shares outstanding (fully diluted)[1]	1,671.1
Implied price (A$ cents)	**0.20**
Current price (A$ cents)	0.057
Upside (%)	*250.1%*

Estimates: Pitt Street Research

[1] *Inclusive of BLG's existing options and shares to be issued under the BLG's recent Placement and Rights Issue.*

Risks

We see the following key risks associated with our investment thesis:

Commercialisation risk: The company is only at the early stage of commercialisation. There is the risk that BLG may endure difficulties in advancing beyond the current stage, including the risk that its GaN lasers fail to qualify with current OEM customers.

Regulatory risk: There is the risk of material changes in standards or regulations relating to the company and its industry. Geopolitical tensions and techno-nationalism may limit the ability of BLG to sell its products into certain jurisdictions.

Competition risk: Although BLG seems to have a unique product, there is the possibility that competing companies may develop superior products to BLG. We note however that any such companies would take some time to catch up given BLG's several years of R&D and that it is now at the commercialisation stage.

Funding risk: BLG may need to raise further capital before it reaches profitability. That may be required, for instance, if its current development programs and technology transfer/qualification take longer than currently anticipated or multiple growth opportunities arise that require additional development capital. Future potential equity capital raises may well be priced to reflect the company's progress but will result in dilution for existing shareholders.

Conclusion

BLG still has a fair journey ahead to profitability and sustainability, but has significantly matured the business and de-risked commercialisation with the recent achievement of several a major milestones; including launching its first products and securing growing customer orders and vertically integrating to gain full-operational control and capture greater revenue capacity. We expect the company to carve out an attractive niche and become a share player in the global market. BLG is one of only a handful of GaN manufacturers globally in a highly constrained market, with high barriers to entry. Its competitors are large incumbents with limited agility and responsiveness and are unable or unwilling to provide dedicated and flexible solutions to customers. BLG has set itself up well by developing a range of offerings to meet unmet needs in the market. We believe BLG is poised to enjoy a successful future in a fast-growing market. We value BLG at $0.20 per share, which implies substantial upside from the current price.

Appendix I – SWOT Analysis

Strengths:

- BLG focuses on blue laser diodes across high-potential segments (industrial, scientific, biotech, display (AR/VR), and defence) with unmet needs and strong customer demand.
- BLG provides flexibility in form factors. This enables customers to avoid undertaking extensive customisation and packaging work post-purchase.
- BluGlass is the only dedicated GaN laser supplying violet and blue laser diodes and is extending its wavelength range to green.
- BluGlass has successfully demonstrated a working GaN Distributed Feedback (DFB) laser, using RPCVD. GaN DFB lasers are not commercially available today.
- There is a management team in place with the required expertise in laser diode manufacturing. It has a clear vision and realistic plan of action to achieve its medium-term targets.
- BLG has greater control of its manufacturing processes with the purchase of Fremont fab last year. It expects to complete vertical integration in FY23.
- BLG's revolutionary RPCVD technology operates at low temperatures and utilises substantially less hydrogen while depositing layers. This technology helps achieve brighter and more cost-effective lasers.

Weaknesses:

- While BluGlass has demonstrated feasible reliability of its lasers and launched first products to market, it will take some time before it has ultra-long (000's of hours of reliability) life reliability testing completed.
- The company is only at an early stage of commercialisation. Ramping up production to levels necessary to meet market demand will take some time.
- While the company has sufficient short-term cash resources, it is unlikely to turn into a cash flow positive company until 2025/26.
- There remain technical risks in demonstrating the performance and manufacturing advantages of BLG's RPCVD technology.

Opportunities:

- BLG is targeting underserved wavelengths for use in industrial, scientific and biotech applications. These target segments have promising growth potential.
- Potential to grow in the green laser diode space. Development work for green laser diodes is currently underway, expedited by the Fremont acquisition.
- Scope for improvement in state-of-the-art facet coating capabilities through potential capital investments.
- BLG is one of only a handful of end-to-end GaN laser diode manufacturers globally.
- Market growth is currently constrained by limited players, and immaturity of GaN laser diode performance (~45% efficiency in state-of-the-art laser diodes, compared with the +90% efficiency of LEDs). BLG's unique tunnel junction technology could address this performance constraint by delivering novel device architectures, designed to overcome this performance loss.

Threats:

- BLG's competitors are established players in the market and are substantially bigger in size.
- Larger R&D budgets at its competitors could threaten BLG's currently perceived competitive advantages in GaN laser diodes.

Appendix II – Analysts' Qualifications

Marc Kennis, lead analyst on this report, has been covering the Semiconductor sector as an analyst since 1997.

- Marc obtained an MSc in Economics from Tilburg University, The Netherlands, in 1996 and a post graduate degree in investment analysis in 2001.
- Since 1996, he has worked for a variety of brokers and banks in the Netherlands, including ING and Rabobank, where his main focus has been on the Technology sector, including the Semiconductor sector.
- After moving to Sydney in 2014, he worked for several Sydney-based brokers before setting up TMT Analytics Pty Ltd, an issuer-sponsored equities research firm.
- In July 2016, with Stuart Roberts, Marc co-founded Pitt Street Research Pty Ltd, which provides issuer-sponsored research on ASX-listed companies across the entire market, including semiconductor companies.

Nick Sundich is an equities research analyst at Pitt Street Research.

- Nick obtained a Bachelor of Commerce/Bachelor of Arts from the University of Sydney in 2018. He has also completed the CFA Investment Foundations program.
- He joined Pitt Street Research in January 2022. Previously, he worked as a financial journalist at Stockhead for more than three years.
- While at university, he worked for a handful of corporate advisory firms.

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