Outperform

(Initiate)

TMT

BYD Electronic (0285.HK)

HK Stock Connect (SH/SZ)

Leading Tech-driven Structural Parts Provider, Cultivating New Growth Points

14/05/2019

Key Data
May 06, 2019

Closing Price (HKD)	13.66
Total shares (Mn)	2,253
Market Cap(HKD/Mn)	30,779
Net Assets (RMB/Mn)	15,825
Total Assets (RMB/Mn)	26,051
BVPS (RMB)	7.02

Analyst

Yidong ZHANG
zhangyd@xyzq.com.cn
SAC: S0190510110012
SFC: BIS749

Contact

Meng CAO
caomeng@xyzq.com.cn
SAC: S0190118070147

Key Financial Indicators

FY	2018A	2019E	2020E	2021E
Revenue (Mn/RMB)	41,047	50,744	57,058	60,846
YoY	5.9%	23.6%	12.4%	6.6%
Net Profit (Mn/RMB)	2,189	2,565	2,961	3,347
YoY	-15.3%	17.2%	15.4%	13.0%
Gross Margin	10.2%	9.4%	9.5%	9.8%
Net Profit Margin	5.3%	5.1%	5.2%	5.5%
ROE	13.8%	14.3%	14.5%	14.5%
EPS (RMB)	0.97	1.14	1.31	1.49
OCFPS (RMB)	2.12	1.20	1.69	2.02

Highlights

Leading global consumer electronics structural parts provider, developing a vertical integration to achieve the synergistic effect. BYD Electronic is currently the only manufacturer in the world that can provide all types of mobile phone structural parts as well as mobile phone assembly services. In 2018, the company's revenue was 41.04 billion CNY, yoy+5.9%, and the net profit attributable to owners of parent was 2.189 billion CNY, yoy-15.33%. The structural parts business contributes to most of the company's profit. The company maintains good relationships with customers by providing assembly service, for example BYDE is in the strategic relationship with Huawei and Xiaomi, realizing synergistic effect between assembly business and structural parts business.

The GM of metal structural parts is expected to be stable, and glass business is hopeful to usher in high growth. In 2018, the company's total structural parts revenue was 18.01 billion CNY, with more than 13 billion from metals, more than 3 billion from plastic, and about 1.5 billion from glass and ceramics. The price competition of metal tended to cool down in 2H2018 and the GM is expected to be stable in FY2019. As for glass business, BYDE is continuing to expand its production capacity. The capacity at the end of 2018 is about 400K~ 500K pieces per day, and is expected to reach 800K ~ 900K pieces per day by the end of 2019. At present, the company can self-make the crucial glass bending machine to obtain cost and capacity deployment advantages. Meanwhile, the company has entered the 3D glass supply chain of leading customers including HOVM and Samsung. With the penetration rate of the "Metal Mid-frame + Glass Back Cover" case soaring in 5G epoch, a drastic growth is predictable in glass business.

Rely on the resources of the Group to develop auto intelligent systems business. In 2018, the segment revenue was 1.19 billion CNY, yoy+150%. BYDE provides auto systems for BYD Auto and is proactively seeking external customers. In 2019, the company will capture 100% share of auto systems in BYD Auto. We expect that the revenue of the auto intelligent system business will increase by 50% in 2019.

Develop new intelligent product business to grasp the opportunities of AIoT products. The business's revenue in 2018 was 4.34 billion CNY, accounting for 10.57% of revenue. BYDE' new intelligent product business mainly focuses on providing all or part of the design, structural parts and system assembly. Major customers include NVIDIA (graphic cards), Amazon (intelligent loudspeaker), iRobot (sweeping robots), etc.

Investment recommendations: We expect the company's revenue in 2019/20/21 to reach 50.7/57.1/60.8 billion CNY, yoy+23.6%/+12.4%/+6.6%, and net profit to reach 2.57/2.96/3.35 billion CNY, yoy+17.2% /+15.4%/+13.0%. We set our target price at 16.0 HKD based on 12x 2019 PE. Considering the uncertainty of price competition, we initiate coverage with an "Outperform" rating.

Potential risks: domestic mobile phone shipments continue to decline, 3D glass and ceramics demand is less than expected, metal structural parts price competition.

This English translation of the original Chinese version <技术驱动的结构件龙头，多元化布局探索新增长点> issued by Industrial Securities on 2019.05.06 is for information purpose only. In case of a discrepancy, the Chinese original will prevail.

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Full text of report

1 Global Consumer Electronics Structural Leader, Vertically Integrated One-shop Supplier

BYD Electronic is the only manufacturer in the world that can provide all types of mobile phone structural parts and mobile phone assembly service. BYD Electronic is principally engaged in the manufacture and sale of mobile phone parts and modules, providing mobile phone design and assembly services, and providing parts and assembly services for other electronic products. The company is the only manufacturer in the world that can provide all types of mobile phone structural parts and mobile phone assembly. The types of structural parts that the company can supply include plastic, metal, glass (3D and 2.5D) and ceramic parts.

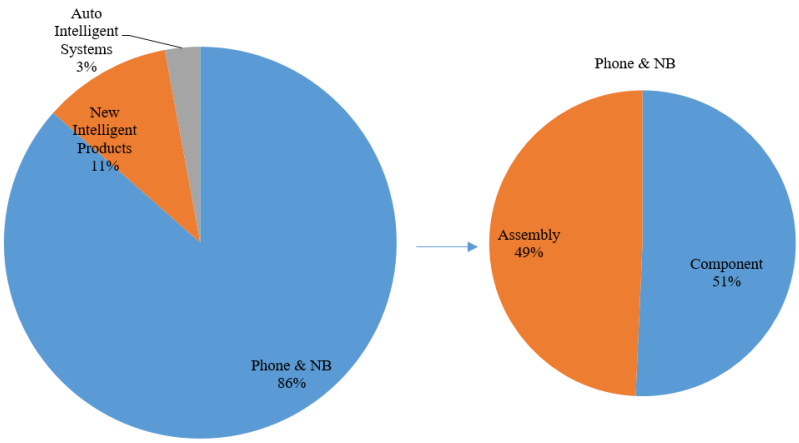
1.1 Main businesses and revenue structure

- **Revenue by segment**

Three major businesses: mobile phones and laptops, new intelligent products, and auto intelligent systems. The company is currently engaged in three major businesses.

1) Mobile phone and notebook computer business. In 2018, the revenue was 35,517 million CNY, of which the revenue of component was about 18,012 million CNY, mainly for mobile phone structural parts. The assembly revenue was about 17,055 million CNY, most of which was mobile phone assembly.
2) New intelligent product business. In 2018, the revenue was 4.34 billion CNY, yoy+70%, accounting for 10.6% of the total revenue, mainly providing the casing and assembly of various intelligent products.
3) Auto intelligent system business. In 2018, the revenue was 1.19 billion CNY, yoy+150%. The main products include in-car multimedia systems, intelligent networking system, communications modules, sensor modules, etc. At present, the in-car multimedia systems are mainly used on BYD Dynasty series cars.

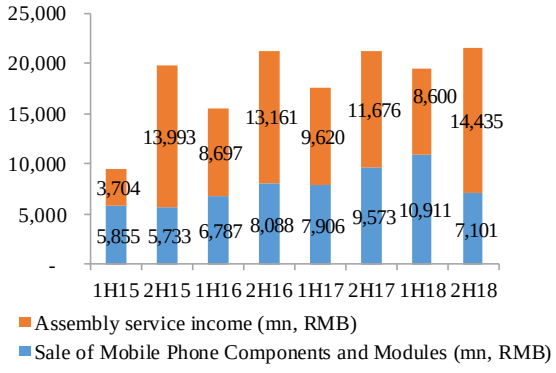
Fig.1 FY2018 BYDE's revenue structure (new classification*)



Source: Company Disclosure, Industrial Securities
*New revenue classification method was used in company's FY2018 annual results announcement

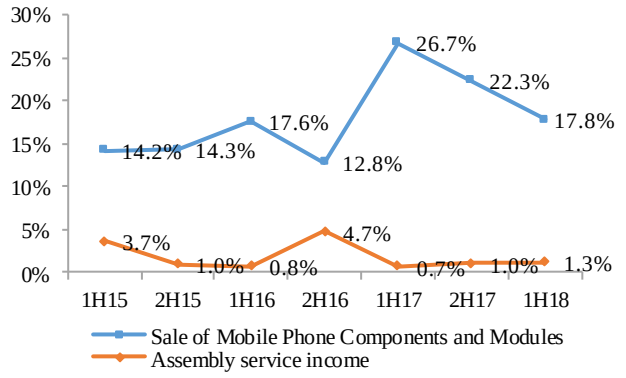
The mobile phone component business is currently the company's most profitable business. Prior to the FY2018 annual results announcement, the company's business revenue was disclosed as two categories, mobile phone parts & modules and assembly services. Among them, the mobile phone parts & modules business's GP margin is relatively high, while assembly service's GP margin is very low.

Fig.2 FY2015-18 BYDE's revenue by segments



Source: Company Disclosure, Industrial Securities

Fig.3 FY2015-18 BYDE's gross margin by segments



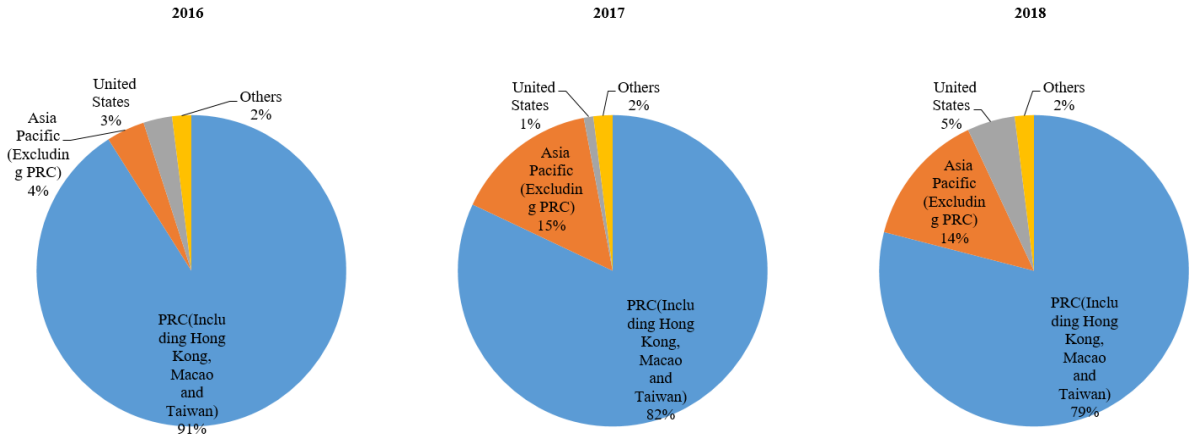
Source: Company Disclosure, Industrial Securities

● Revenue by region

Mainly deal with large customers in the Asia Pacific region, the largest mobile phone structural parts supplier of Huawei. The main business of BYD Electronic is located in the Asia-Pacific region, especially in China. In addition, the company also has a certain proportion of business in the United States and the European Union. BYD Electronic' major customers such as Samsung, Huawei, OPPO, LG, VIVO, etc. are all leading smartphone suppliers in the Asia Pacific region. The company is currently Huawei's largest supplier of mobile phone structural parts, accounting for 50-60% of

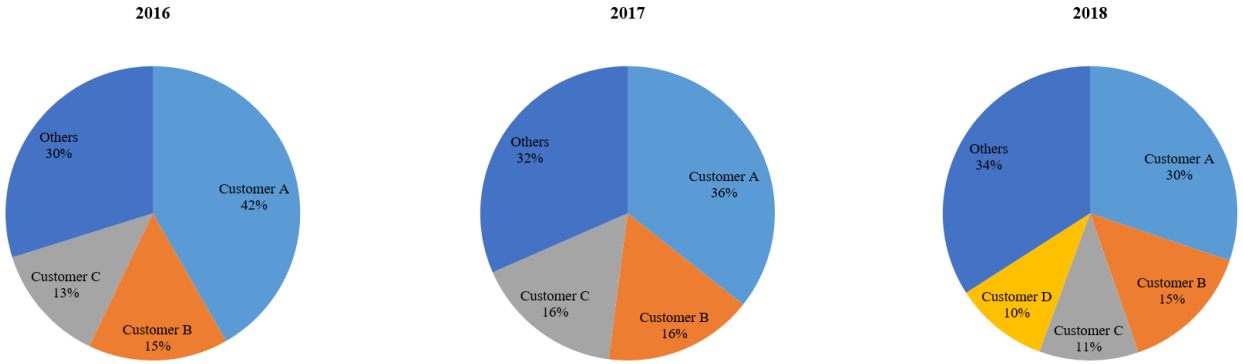
Huawei's metal structural parts demand, and 40-50% of Huawei's mobile phone assembly. BYD Electronic's main customers have maintained a steady state of shipment in the past five years which provides a strong guarantee for the company's mobile phone components business.

Fig.4 FY2016-18 BYDE's revenue by region



Source: Company Disclosure, Industrial Securities

Fig.5 FY2016-18 BYDE's revenue by major customers

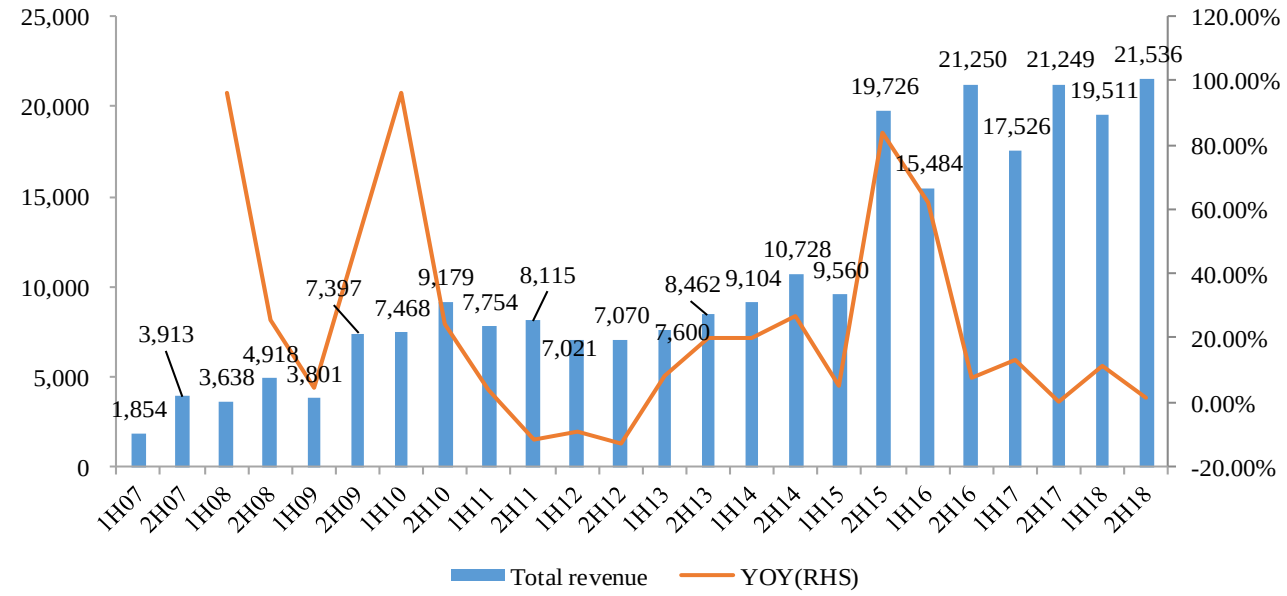


Source: Company Disclosure, Industrial Securities

1.2 Review of financial results since listing

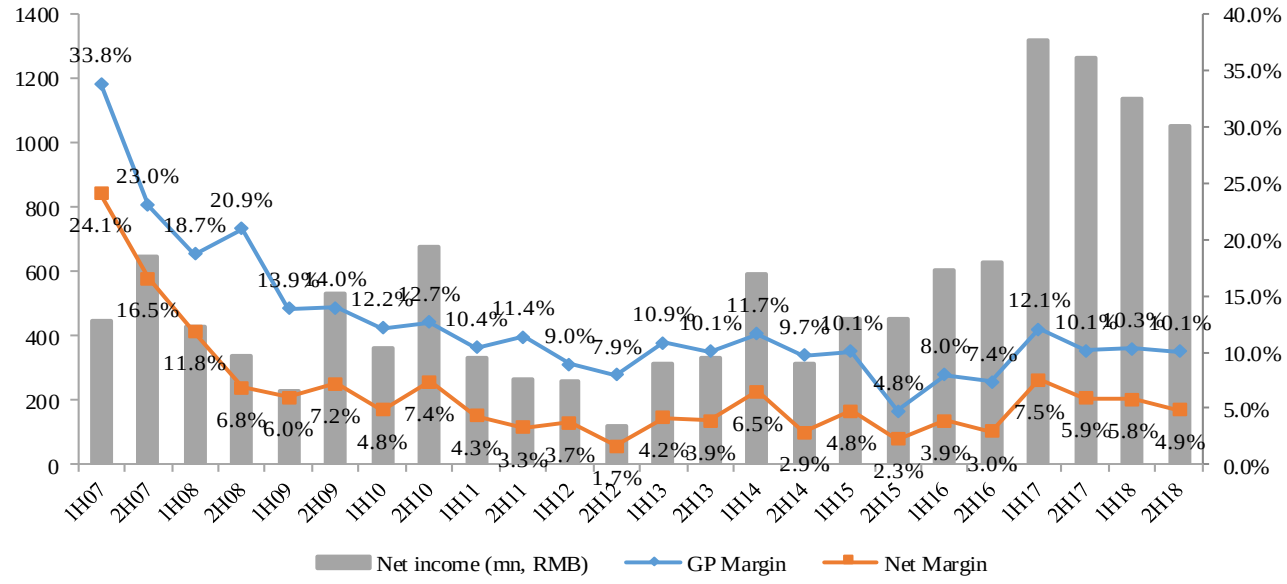
With the rise of smartphones, the company's revenue has grown steadily. Since BYDE was spun off from the BYD Group in 2007 and listed on the Hong Kong Stock Exchange, its revenue and profit have generally maintained a steady growth. In 2011-2012, the company's revenue declined due to product structure changes. In the second half of 2015, the assembly business revenue soared because of large EMS orders from a big customer. Since then, the company's revenue has maintained a steady growth. In 2018, the company's revenue was 41,047 million CNY, yoy+5.86%, with a CAGR as high as 19.53% from 2007 to 2018.

Fig.6 BYD Electronic's revenue (RMB, mn) and yoy growth rate since listing



Source: Bloomberg, Company Disclosure, Industrial Securities

Fig.7 BYD Electronic's gross margin and net margin since listing



Source: Bloomberg, Company Disclosure, Industrial Securities

1.3 BYDE's management

BYD Electronic's technology-driven philosophy is closely related to its management team. Since the establishment of BYD Group, Chuanfu Wang, the core leader of the company, has been adhering to the idea of "technology is king, innovation-oriented". BYD Electronic, as a subsidiary of BYD Group, has always been following the group's philosophy.

Tab. 1 BYD Electronic's management

Name	Position	Age	Resume and Duty
Chuanfu Wang	Chairman of the board of directors,	53	Graduated from Central South University of Technology (now Central South University) with a

	non-executive director		bachelor's degree in 1978. Graduated from the Beijing Institute of Nonferrous Metals Research in China in 1990 with a master's degree. Served as deputy director of Beijing Nonferrous Metals Research Institute and general manager of Shenzhen Bige Battery Co., Ltd. Co-founded Shenzhen BYD Industrial Co., Ltd. in 1995 with Lu Xiangyang as general manager; Serves as non-executive director and chairman of BYD Electronic. He also serves as Chairman, Executive Director and President of BYD Group, Director of Shenzhen BYD Daimler New Technology Co., Ltd. and Director of BYD Charity Foundation.
Nianqiang Wang	Executive Director, CEO	55	Graduated from Central South University of Technology in 1987 with a bachelor's degree. Received a master's degree in business administration from the China Europe International Business School in 2011. Joined Shenzhen BYD Industrial Co., Ltd. as the chief engineer in 1995. Served as Vice President of BYD and General Manager of the First Business Unit and a member of the BYD Charity Foundation. Resigned as Vice President of BYD in 2015.
Bo Wang	Executive Director	46	Graduated from Harbin Institute of Technology in 1993 with a bachelor's degree. Joined BYD Co., Ltd. in 2001, mainly responsible for marketing and sales. Appointed as the General Manager of the Marketing Division of BYD Electronic Group since 2012.
Aiyun Zhu	CFO	54	Graduated from Changsha Jiaotong University in 1988 with a bachelor's degree. Obtained a master's degree in business administration from Peking University in 2008. Joined the BYD Group in 1997 and has served as an accountant, manager of the finance department, and senior manager of the finance department. Joined BYD Electronic in April 1997 and is currently the Chief Financial Officer of the company, overseeing finance and accounting, human resources and general administrative matters.
Yizao Sun	COO	55	Graduated from Jiangxi Radio and Television University in 1990. Joined BYD Group in 1994 and has served as manager of design department, manager of engineering department, manager of parts factory and general manager of third business department. Joined BYD Electronic since 2002 and was responsible for managing different areas of the company's business, such as production, procurement and quality control. He is currently an executive director and chief operating officer of the company.

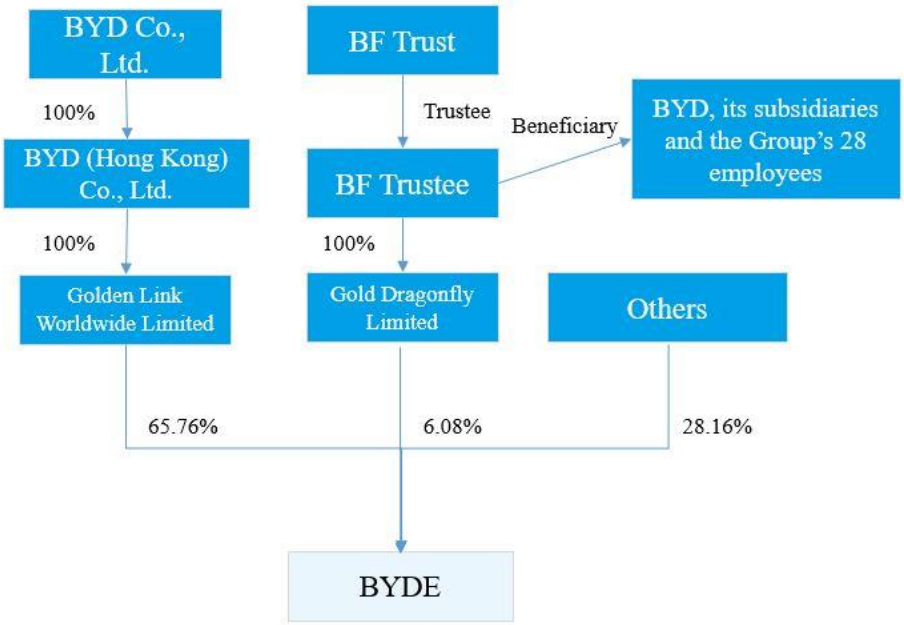
Source: Wind, Company Disclosure, Industrial Securities

1.4 BYDE's Equity Structure

The shareholding structure is clear and the number of outstanding shares is stable. BYD Electronic was spun off from the parent company BYD on December 20, 2007. As a subsidiary of the BYD Group, BYD enjoys a 65.76% share of BYD Electronic. In addition, BYD, its subsidiaries and the Group's 28 employees indirectly held 6.08% of the company's shares as trust beneficiaries. The company issued 2,200 million shares through IPO, since then the company's shares slightly changed several times. Since

2010, the company's shares have remained at 2,253 million, and all shares are tradable.

Fig.8 Company's equity structure



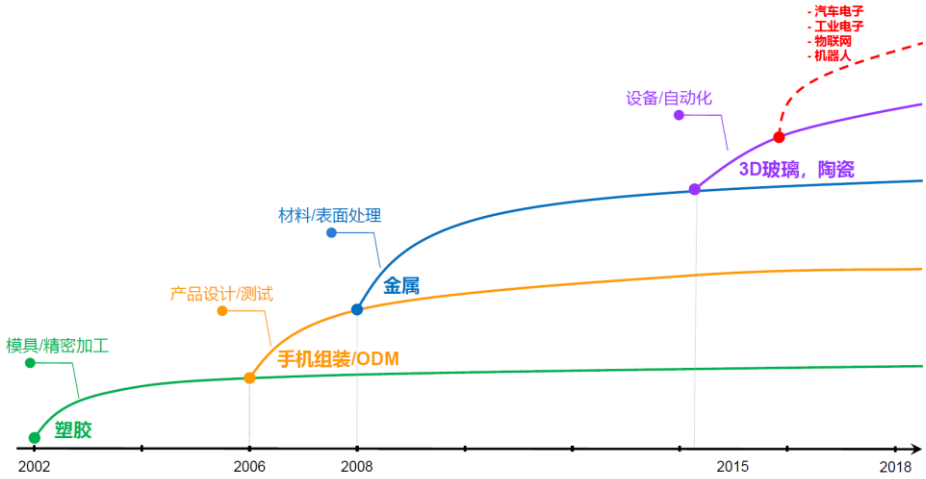
Source: Company Disclosure, Industrial Securities

1.5 BYDE's competitive advantages

- **Technology-driven philosophy builds core competitiveness**

BYD's technology-driven philosophy allows the company to early perceive changes in market demand and prepare for it proactively. As a supplier of mobile phone casing and parts, BYD Electronic has been dealing with many different materials. In the pre-smartphone era, the company supplied mobile phone structural parts for Nokia and Motorola, and started business in plastic. Following the footsteps of smart phones, the company has been deployed in the field of metal parts. With the advent of the 5G era, consumers' demand for high-end structural parts such as glass and ceramics broke out, and the company also invested in advance to catch the opportunities.

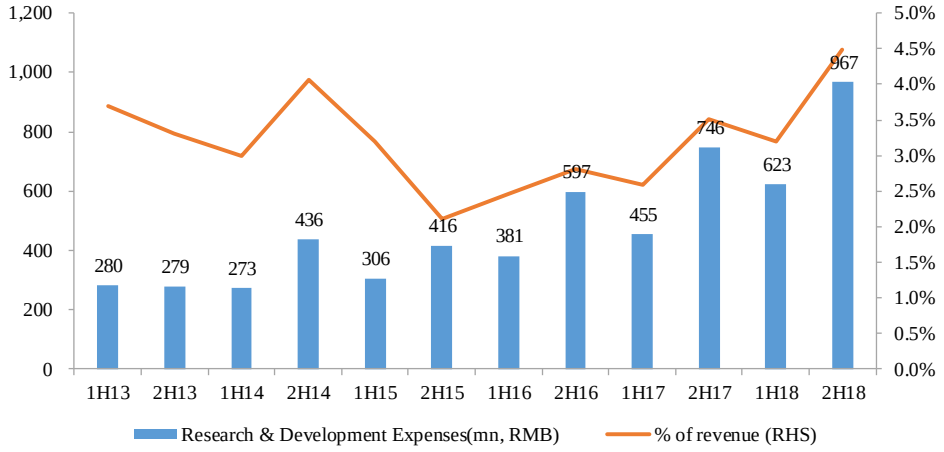
Fig.9 BYDE's transition in businesses and relevant technologies



Source: Company Disclosure, Industrial Securities

The amount of R&D investment is considerable, reserve of talent is sufficient.. In 2018, the company's research and development expenses increased to 1.59 billion, yoy+30%, mainly for the research and development of glass, ceramics, auto intelligent systems. In 2018, the company added three R&D centers and applied for 232 patents. BYDE has more than 2,000 patents related to material by now. BYDE has a R&D team of about 1,500 people, including a material development team of 500 people and a smart manufacturing team of 600 people. The talent pool includes more than 50 doctors, and engineers with more than 8 years of work experience account for 56% of the total. The team is well educated and experienced.

Fig.10 BYDE's R&D expense



Source: Company Disclosure, Industrial Securities

Self-developing material technology, BYDE has accumulated abundant results. BYD Electronic's emphasis on independent research and development has enabled it to acquire many capabilities such as material R&D capability, technology R&D capability, etc. The 7-series aluminum alloy after anodizing, which is developed by the company has better performance than ordinary aluminum alloy. It has stronger strength and rich colors. At present, the company has provided high-quality 7 series aluminum mobile phone casings for many customers such as Huawei, Samsung and Xiaomi. In addition, with more than ten years of experience in the production of silicone structural parts, the company can use a liquid silicone injection molding machine equipped with a high-precision plunger injection unit to precisely control the amount of liquid silicone injection glue, which is widely used in smart phones and home appliances, maintaining the company a leading position in the industries. The company has also achieved expansive outcomes in the R&D of new materials, including self-made ceramic powder, glass melting technology, etc.

Fig.11 BYDE's vista in technology

Source: Company Disclosure, Industrial Securities

- **Vertical integration bring synergistic effect**

BYDE maintain good relationship with customers by providing them handset assembly service, which brings a synergistic effect on the sale of casings and parts. Since 2007, BYD Electronic has been providing assembly business, including ODM and EMS. Assembly service revenue accounts for a large proportion of BYDE's total revenue. At present, the company mainly provides one-shop solutions consisting of SMT, assembly, testing, packaging and after-sales for mobile phones and tablets, and smart wearables. The assembly service business accounts for a relatively large proportion of revenue, while the gross profit margin of the business is practically low at about 1%, which makes little direct contribution to the company's profit. Its main meaning is to provide convenience to customers through one-stop service, helps maintain customer relationships. In the future, the company will gradually reduce the pure assembly business, and strive to increase the proportion of assembly business for strategic customers such as Xiaomi and Huawei to achieve closer relationship.

Fig.12 Company's capability of vertical integration in industry chain

Source: Company Disclosure, Industrial Securities

Fig.13 BYD Electronic provides comprehensive solutions

研发	制造	供应链管理
• 无机材料	• 模具	• 供应商开发
• 有机材料	• 塑胶产品	• 供应链管理
• 工艺设备	• 金属产品	• 物料代采
• 自动化设备	• 玻璃产品	
• 结构设计	• 陶瓷产品	
• 硬件设计	• 充电器	
• 软件和算法	• 电池PACK	
• 产品测试	• PCBA	
• 产品认证	• 系统组装	

Source: Company Disclosure, Industrial Securities

The company's technology is recognized by the brands, and the strategic cooperation is actively carried out to ensure market share. In 2018, BYD Electronic was awarded Huawei Quality Excellence Award, Huawei Global Gold Supplier, Gemalto Excellent Supplier, vivo Innovation Award & 20-year Cooperation Award, NVIDIA Best Partner Award and many other awards by major customers. Its strategic cooperation position with major customers continues to deepen. In addition, the company will also strive to increase the proportion of assembly in strategic customers such as Xiaomi, Huawei to achieve closer relationship. Meanwhile, in 2018 the company won Korean customers' trust by Samsung Note 9 case. We expect the company will gain more maket share in Korean customers in 2019.

- **Diversified to explore new growth points**

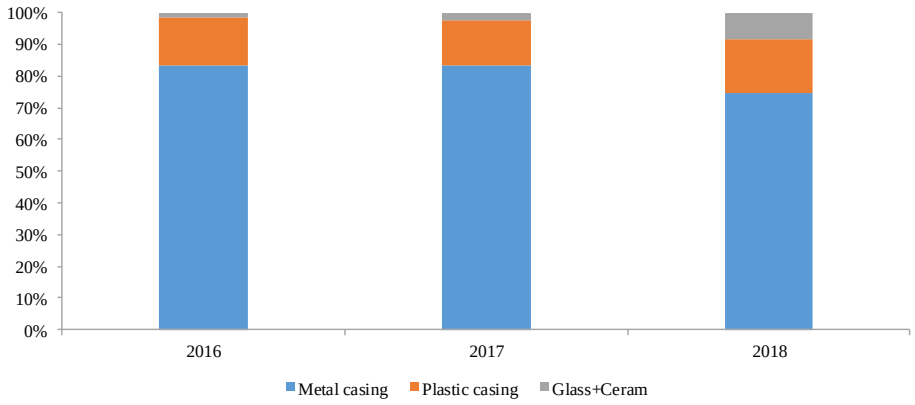
While safeguarding the competitiveness of its core business, BYD Electronic has also engaged in and made substantial progress in new fields such as auto electronics, industrial electronics, IoT, and robotics, etc. The company has provided several world-renowned car manufacturers with intelligent control systems, intelligent network systems and communication modules. In the field of new intelligent products and IoT

products, BYD Electronic also makes active investment, not only in product manufacturing, but also in the design and development of partial products. The early deployment of these emerging businesses helps company to achieve long-term growth.

2 Metal casing price war tends to ease, 3D glass will grow rapidly

Metal casing accounts for the largest proportion currently, while glass is expected to grow rapidly. BYD Electronic's component business (casing and parts) is the main source of its profits. The revenue of the component business was 14,876/17,478/18,012 million CNY in 2016/17/18. Metal casing accounts for approximately 80% of the total in 2016 and 2017. In 2018, glass and ceramics business revenue reached around 1.5 billion CNY, more than five times as much as in 2017.

Fig.14 BYDE's component revenue by material



Source: Company Disclosure, Industrial Securities

2.1 Metal: demand for mid-frame grow, price war slow down, market position remain stable

Currently, the all-metal structural part is mainly used in the middle and low-end models, but these demand may gradually shrink in the 5G era. Since the launch of iPhone5 in 2013, the good texture of metal handset case has won the favor of many consumers. Therefore, it seems unstoppable that plastic structural parts is gradually replaced by metal structural parts, as the latter one has become the preferred casing material for smartphone suppliers. Many smartphone brands have joined the metal casing league, and the penetration rate of metal casings has maintained a high growth trend. According to IDC data, from 2014 to 2017, the penetration rate of metal phone cases in global smartphones has soared from 14% to 37.4%, and in 2018 it has reached more than 50%. With the mature of technology and capacity expansion, the cost of metal casings has dropped rapidly, and the penetration trend of metal casings in the low-end market has gradually started. In 2018, major manufacturers have released mobile phone with all-metal body at the price of 1000-2000 CNY. However, due to metal's interference on 5G high-frequency signal and wireless charging, it won't be suitable in 5G era. The demand for all-metal casing will gradually shrink.

Fig.15 All-metal body mobile phone launched in 2018

Source: Zol, Industrial Securities

Metal structural parts are still useful as "metal mid-frame + glass back cover" is adopted by most medium and high-end models. In the 5G era, the penetration rate of "non-metal back cover + metal mid-frame" will increases. Since the all-metal body cannot adapt to 5G communication network and wireless charging, the design is transitioning to the "metal middle frame + non-metal back cover". Metal structural is still needed to support back cover, such as "3D glass + metal mid-frame", "ceramic + metal mid-frame". The combination of "metal frame + non-metal back cover" can meets the requirements of 5G communication. We think the main stream design of 5G mobile phone will be "non-metal back cover + metal mid-frame" in the early stage of 5G. The latest example Samsung S10+ 5G version released this year with "metal mid-frame + glass back cover" design.

Tab. 2 Handsets with "metal mid-frame + glass back cover" design launched by mainstream brands since 2018

Brand	Model	Price
Apple	iPhone XS	7799
Apple	iPhone XS Max	8299
Apple	iPhone XR	5299
Samsung	GALAXY S10+	6999
Samsung	Note9	6599
Samsung	GALAXY S10	5999
Samsung	GALAXY S9+	5499
Samsung	GALAXY S9	4499
Samsung	A9s	3799
Samsung	A8s	2799
Huawei	Mate RS	13000
Huawei	Mate 20 Pro	5399
Huawei	Mate 20 X	4999
Huawei	P20 Pro	4888
Huawei	Mate 20	3499
Huawei	P20	3388
Huawei	nova 4	3099
Huawei	Honor V20	2999
Huawei	nova 3	2599
Huawei	Maimang 7	2199
Huawei	Honor 10	2099
Huawei	nova 4e	1999
Huawei	nova 3i	1899
Huawei	nova 3e	1749

Huawei	Honor 10 Youth version	**1499**
MI	MI 8 Exploration version	**3699**
MI	MI 9	**3299**
MI	MI 8 Screen fingerprint version	**3199**
MI	MI 8	**2499**
MI	MI 9 SE	**1999**
MI	MI 8 SE	**1699**
MI	MI 8 Youth version	**1699**
VIVO	VIVO NEX Double-screen version	**4999**
VIVO	VIVO NEX Flagship version	**4299**
VIVO	X27	**3598**
VIVO	X23	**3198**
VIVO	X21	**2498**
OPPO	OPPO Find X	**4999**
OPPO	OPPO R17 Pro	**3999**
OPPO	OPPO R17	**3199**
OPPO	OPPO R15 Dream	**2999**
OPPO	OPPO R15	**2699**
OPPO	A3	**1599**

Source: Zol, Industrial Securities

The metal mid-frame is expensive and have larger margin space than metal back cover. At present, the mainstream 3D glass casing price is 10~15 USD, and the corresponding metal mid-frame price is 15-20 USD, even higher than the paired 3D glass cover. The profit margin of metal mid-frame is higher. Compared to the metal body, the processing of metal mid-frame is more difficult and high value-added.

BYD Electronic is one of the three companies worldwide that have mastered the PMH injection molding technology. PMH (Polymer Metal Hybrid) technology is used to tightly combine plastic and metal. Numerous nanoscale microporous structures on the surface of the metal parts will be formed after treated by PMH technology, and then plastic injection molding is applied to make seamless bond between metal and plastic. This technology is very helpful for the combination of metal and plastic in mobile phone structural parts. In 2011, BYD Electronic self-developed PMH injection molding technology, and successfully developed the antenna distribution scheme of mobile metal structures under 3G and 4G communication, which leaded to the era of metal-body mobile phones. The company applied this technology to more than 300 million metal parts ordered by Samsung, Huawei, vivo, Xiaomi, Motorola, Google, HTC and other global customers.

BYD Electronic has up to 30,000 CNC equipments, with an annual production capacity of 200 million pieces, manifesting the capability in large-scale delivery. The company has a reserve of more than 30,000 units in the CNC and 10,000 units of external ones, ranking at least second in the world. Such high reserves of CNC equipments enable BYD Electronic to achieve scale effects and easily handle ultra-high-intensity orders. Since the demand is concentrated in few top customers, large customers will give a very large order. The company once arranged 10,000 CNC equipments for Samsung within a week.

Fig.16 BYDE's blueprint in automation

Source: Company Disclosure, Industrial Securities

The automation transformation has achieved remarkable results, greatly improving yield and reducing labor requirements. BYD Electronic has also made great progress in the automation of CNC processing. In 2018, automation development investment accounted for about 20% of the company's total R&D expense, yoy+20%. In the production process of CNC, laser engraving, injection molding, etc., the average automatic coverage rate exceeds 90%, which significantly exceeds industry average. Thanks to automation, the average CNC yield rate rised 2 pcts. For a typical workshop, BYDE's automation save approximately 80% of labor requirements. At present, BYDE's automation level is in the transition from production line automation to workshop automation. In the long-term, the company's goal is to have smart factories that integrate cloud, IoT and big data technology.

The price war of metal casing and parts tends to ease, and the gross profit margin is expected to be stable. In 2018, due to the price competition in metal casing, the gross profit margin fell to around 20%, much lower than around 27% in 2017. Looking forward to the future, the supply is basically stable. BYD Electronic, the industry leader, has no expansion plan. After fierce price competition, there is also no incentive for small-scale competitors to expand production. The demand for metal structural parts is still stable, although the non-metallic back cover is the trend, but the metal mid-frame used as a support is still needed. The price competition of metal structural parts tends to ease in the second half of 2018. We expected that the gross profit margin of metal casing and parts will remain stable in 2019.

2.2 Plastic: gained more market share in Huawei and Xiaomi

The main demand comes from low-end mobile phones, and composite panels help to differentiate the appearance. With the lowest price, plastic still dominates in low-end mobile phone. In the past two years, composite panels have won certain market demands due to their dazzling appearance. Among the mobile phones launched by mainstream brands in 2018, all the A series models of OPPO except A3, the Y series models of vivo, and the Redmi series of Xiaomi still use plastic casing. However, as

the price of 2D glass cover decreases, the price advantage of composite panel for glass is lost, what's worse the composite panel faces the problem of poor wear resistance. We expect that some low-end mobile phones may turn to "2D Glass Back Cover + Metal Mid-frame" design.

Fig.17 VIVO Z3 adopts gradient color plastic back

Source: VIVO's official website, Industrial Securities

Fig.18 Models using plastic casing lauched since 2018

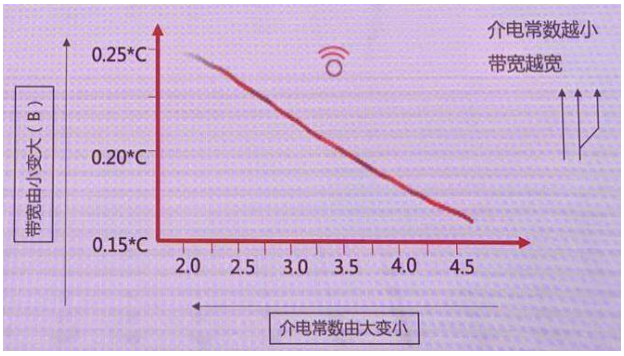
Brand	Model	Price
Xiaomi	红米 6	799
Xiaomi	红米 6A	599
Xiaomi	红米 6Pro	999
Xiaomi	红米 Note5	1099
Xiaomi	红米 S2	999
OPPO	A1	1399
OPPO	A5	1399
OPPO	A7	1599
OPPO	K1	1599
VIVO	Y71	1000
VIVO	Y85	1398
VIVO	Y93	1698
VIVO	Y97	1898
VIVO	Z3	1598

Source: Zol, Industrial Securities

Benefit from the withdrawal of Huawei and Xiaomi ODM models, the market share has increased. Recently, some models of Huawei and Xiaomi that were previously ODM have been taken back in the consideration of quality control. The quality requirements of these low-end models raised. As a leading plastic casing provider, BYDE gained more market share in Huawei and Xiaomi. It is expected that this effect will continue in 2019 and the company's plastic components business will continue to grow.

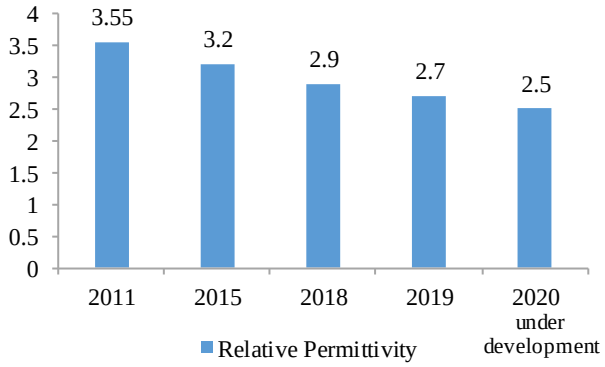
Develop a low permittivity PMH plastic to prepare for 5G. Due to the negative correlation between permittivity and bandwidth, the requirement for permittivity of PMH plastic is more stringent under 5G communication. Conventional plastic materials have a permittivity of 3.5 ~ 3.6, and only plastic with a permittivity of 3.3 or less meet the standards for low permittivity plastic. In 2015, BYD Electronic introduced the first low permittivity PMH plastic in the world, achieving a permittivity of 3.2. In the past two years, BYD has made breakthroughs in this technology. It is expected that the fourth generation of products with a permittivity of 2.5 will be launched in 2020. The combination of low permittivity PMH plastic and metal middle frame can solve the signal shielding problem under 5G high frequency communication.

Fig.19 Negative correlation between permittivity and bandwidth



Source: Company Disclosure, Industrial Securities

Fig.20 BYDE' progress in PMH

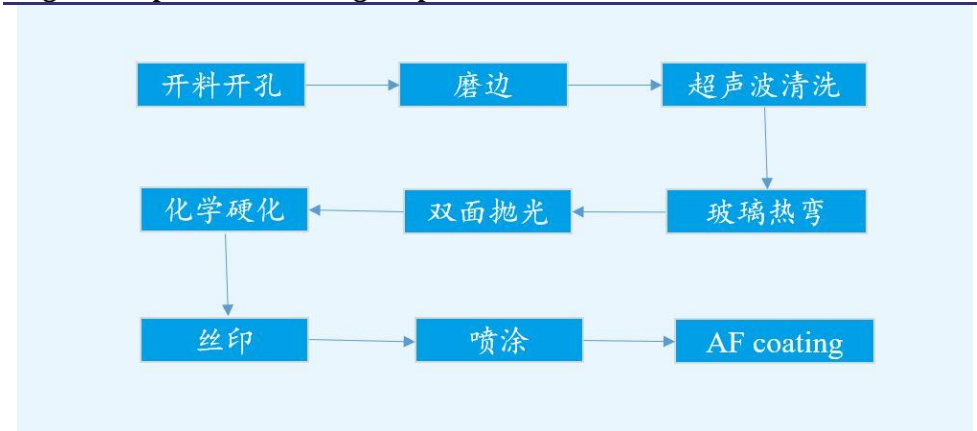


Source: Company Disclosure, Industrial Securities

2.3 3D Glass: capacity drives growth, self-made bending machine bring cost advantage

The production of 3D glass cover is basically the same as that of 2D and 2.5D glass cover. The biggest difference is that 3D glass needs hot bending treatment and the price is higher. The traditional glass casing are mainly 2D and 2.5D glass. The 2D glass is a flat glass, and the 2.5D glass a falt glass with curved edge. The distinction of 3D glass is that both the middle area and edge are be curved. The production procedure of 2D and 2.5D glass includes engraving, tapping, polishing, strengthening, silk screen printing and coating. The production procedure of 3D glass is basically the same as that of 2D and 2.5D products. The biggest difference is that 3D glass need hot bending process. Recently, the price of 3D glass is roughly 50~70 CNY, while 2.5D glass is roughly 20~30 CNY.

Fig.21 The procedure of 3D glass production



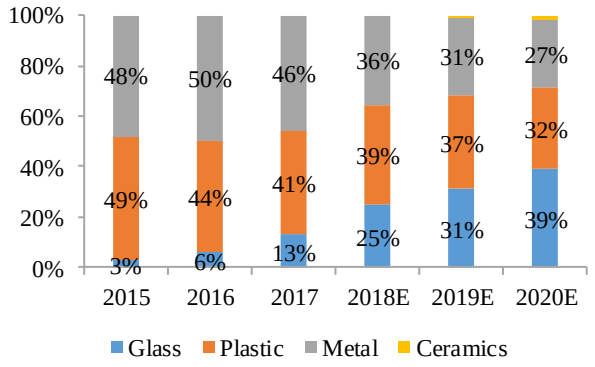
Source: Global Glass, Industrial Securities

Considering cost and effect, 3D glass is the best choice for high-end 5G mobile phones. With the advent of the 5G, all-metal mobile phone will inevitably exit from the mainstream stage, and 3D glass is undoubtedly the most suitable replacement. The advantages of 3D glass include lightness, transparency, anti-fingerprint, scratch resistance, etc. The touching feeling is good. What's more, 3D glass front cover is a

must when the screen is designed to have curved edges.

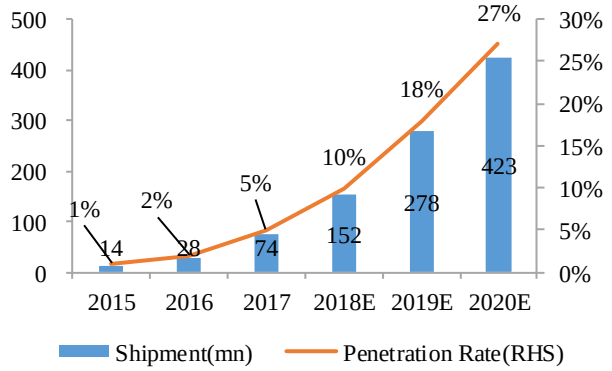
With the upward penetration of the glass back cover as well as the proportion of 3D glass in glass, the shipment may significantly increased. According to AVC, the penetration rate of glass back cover in global smartphone market is 13% in 2017, and the shipment of 3D glass smartphone is 74 million, accounting for about 30% in total glass shipment. It is estimated that by 2020, the penetration rate of glass will reach 39%, of which 3D glass will account for 70% and the shipment of 3D glass cover will be about 423 million.

Fig.22 Penetration rates of global smartphone back cover material



Source: AVC, Industrial Securities

Fig.23 Shipment and penetration rate of 3D glass back cover in global smartphone market



Source: AVC, Industrial Securities

The mainstream flagship handsets are designed with a glass back cover, the demonstration effect may drive the penetration rate up. At present, the flagship models of mainstream mobile phone models are basically equipped with a 3D/2.5D glass cover. In 2018, all iphones have a glass back cover, which need roughly 200 million glass covers. And the total demand of glass casing in Android phones is about 120 million in 2018. It is expected that the total demand will be 300-400 million in 2019. Under the demonstration effect of the flagship model, we expect the market demand for glass will be significantly increased, and the penetration rate will soar.

Self-made hot bending machine to reduce production costs and gain capacity deployment advantages. In the production process of 3D glass, the hot bending process need a core equipment called hot bending machine. In the past, high-end hot bending machines were monopolized by Korean and Taiwanese companies with the price was as high as 1.8-2.4 million rmb, while most domestic manufacturers were in the stage of R&D and small-batch shipments. In the second half of 2017, BYD Electronic has realized the self-made 3D glass business core equipment hot bending machine, the equipment cost is reduced to 400,000 to 500,000 rmb per unit, which greatly gains the cost advantage of the 3D glass business, and can flexibly deploy capacity according to demand, never subject to equipment restrictions. In addition, BYD Electronic has also broken through key technologies such as glass hot bending, polishing and lamination, and is able to make 3D glass PET membrane.

Fig.24 3D hot bending machine

Fig.25 BYDE's ability in 3D glass

Source: SOHU Tech, Industrial Securities

Source: Company Disclosure, Industrial Securities

The glass production capacity is about 400K to 500K pieces per day at the end of 2018, and it is expected to reach 800K to 900K pieces per day by the end of 2019. The Huizhou Glass Factory started mass production in 2017 and currently has a capacity of 300K/day. The Shantou Glass Factory began mass production in June 2018 with a design capacity of 500K/day. At the end of 2018, more than five 3D glass cases were produced. The production capacity of BYD Electronic has reached 400K to 500K/day at the end of 2018, and it is about 100 million pieces per year in total. The company expects the production capacity of the glass will be increased to 800K-900K/day by the end of 2019 and about 200 million pieces/year for the whole year.

Leading customer orders are pulling, and the position in the glass casing industry chain is rising. In 2018, BYDE did not receive Samsung's 3D glass orders. Among large customers such as Huawei, Xiaomi, OPPO, VIVO and LG, the company only served as the first supplier of VIVO X21, X23 models and as second or third suppliers of other models. In 2019, Samsung will become an important customer of BYDE. The company's share in other major customers is expected to rise in the furture.

2.4 Ceramics: self-made ceramic powder help to reduce cost, but demand is weak

The ceramic material has excellent performance, but its price is too high to be widely accepted. Ceramic materials have high hardness and good texture. Ceramic's performance is much higher than glass, aluminum alloy and plastic. As a label for high-end consumer electronics products, the superiority of zirconia ceramics is obvious in terms of texture. In addition, the dielectric loss of the ceramic structural part for the 5G high-frequency signal is basically zero, even smaller than that of the glass, making it an alternative to the mobile phone structural part in the era of 5G high-frequency communication. At present, due to the high price, the share of ceramic casing is pretty small.

Tab. 3 Comparison in properties of various materials

Material	Ceramics	Glass	Plastics	Alum alloy	External property
Hardness(HV)	1350	600~670	75~80	190~200	Scratch resistance
Thermal expansion coefficient(1E-6 /K)	10	8.45	10	24	Thermostability
Relative permittivity	22~30	7~7.5	2.4~3.8	conductive	EWI suppression
Fastness(Pa)	1000~1200	650~750	/	/	Bending resistance

Source: Handset Tech, Industrial Securities

Among the major mobile phone brands, Xiaomi is the biggest supporter of ceramic casing. Since the adoption of the ceramic body in MI 5, the follow-up MI 6, and the high-end model series MIX launched by Xiaomi have also adopted the ceramic case. It seems that ceramic body has become the mark of high-end mobile phones for Xiaomi.

Tab. 4 Customer electronic products on sale with ceramic casing

Brand	Model	Release time	Price	Ceramic usage
Samsung	S10+ ceramic version	2019/03	**9000-12000**	body
MI	MIX 3	2018/10	**3299-4999**	Four curved surface body
MI	MIX 2S	2018/03	**2399-3999**	Back cover
MI	MIX 2	2017/08	**2299-3599**	Four curved surface body
MI	MI 6 ceramic version	2017/04	**2499-2999**	Four curved surface body
OPPO	R15 ceramic version	2018/03	**2494-2699**	Four curved surface body
Honor	Watch Magic aquamarine ceramic version	2018/12	**1299**	Back cover
Honor	Watch Dream apricot ceramic version	2019/01	**1299**	Back cover

Source: Industrial Securities

Samsung released S10+ ceramic version, supporting the marketization of the ceramic casing. After Xiaomi's years of hard work in the field of ceramic structural parts, Samsung also introduced the ceramic version in the top model of its high-end model S10+ series in March 2019, which will become a powerful promoter of the ceramic parts. BYD Electronic is one of the main suppliers of Samsung 10+'s ceramic back cover.

Self-made ceramic powders help to reduce cost. As early as 2008, BYD Electronic provided ceramic parts to Nokia's high-end models. In addition, some ceramic technologies are also used in electric vehicles. The price of powder is a constraint in the cost of ceramic structural parts, and the gross profit margin of the powder supplier is as high as 40%. In the past, the company purchased the powder of zirconia ceramics from TOSOH. Now BYD Electronic has finished the development of ceramic powder, which help to reduce the cost of powder to about 1/3 of the original, greatly improving the competitiveness of the company's ceramic business.

Fig.26 Samsung S10+ ceramic version

Source: Samsung, Industrial Securities

Fig.27 BYDE's self-made colorful ceramic powders

Source: Company Disclosure, Industrial Securities

Capacity is ready, waiting for the release of demand. The ASP of the ceramic back cover is about 150 rmb, and the gross profit margin is expected to reach 30%. At present, the production capacity of BYD electronic ceramic powder is 8 tons/day, and the production capacity of ceramic casing is one million pieces/month. The current market demand has yet to be released. If the market demand climbs in the future, the company is expected to benefit.

3 Auto intelligent system & new intelligent products, long-term growth points

BYD Electronic can provide the assembly and design of structural parts for consumer electronics, smart hardware products, auto and industrial electronics. The company's current assembly and manufacturing capacity is more than 100 million pieces per year. In future, the demand of auto intelligent systems and new intelligent products will gradually expand, becoming new growth points.

Fig.28 BYD Electronic' assembly lines for electronic devices

Source: Company's website, Industrial Securities

3.1 Auto intelligent system: follow electrification of auto, rely on the resources of BYD group, seek external customers

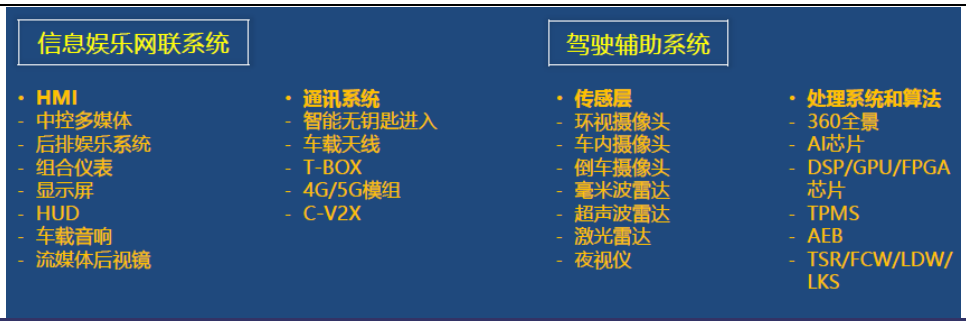
BYD Electronic is mainly faced with group customers, while expanding external customers. BYD Electronic's auto business began in 2013 and was originally a supplier of some models of BYD Auto. At present, BYD group is still the most important customer, but BYDE also has some external customers. BYDE's module manufacturing ability is well recognized as world-class. BYDE provides DiLink systems for BYD Auto, including OS, UI and product manufacturing. In the future, it is expected that more than 80% of BYD cars will be equipped with DiLink system, mainly covering cars and SUVs whose retail prices exceeding RMB 100,000. The DiLink intelligent car system is relatively expensive, the cheaper version of which may cost 3,000~4,000 rmb. For external customers, BYDE provides modules for Tier1 customers, and the terminal products are used in well-known brands such as BMW and Audi.

Fig.29 BYD auto is equipped with DiLink auto system

Source: Auto Home, Industrial Securities

Based on the DiLink system, BYED actively carry out product diversification. At present, BYDE's auto business is mainly the sale of DiLink systems. In 2019, it will gradually diversify its product mix, including dashboards, 360 image systems, and automatic parking systems. During the year, the company released a leading intelligent cockpit system with a 90-degree self-adjusting rotary central control panel, which was well received by customers. The auto structural parts business is also taken into consideration. BYDE is currently collaborating with American autopilot companies about this business, the contents of which include sensing modules, loudspeakers, cameras and motors. The project is still in negotiation, and is expected to enter mass production stage in 2020-2021 with a considerable scale.

Fig.30 BYDE's plan in auto intelligent system



Source: Company Disclosure, Industrial Securities

Business outlook: The revenue of auto intelligent system in FY2018 was 1.19 billion CNY, yoy+150%, and the gross profit margin was about 10%. BYD Electronic owns the design ability through the combination of consumer electronics and auto electronics, both testing and manufacturing capabilities, along with "Auto Factory + Tier 1 Tech" vertical integration, to create the core value. In 2019, the global auto market is supposed to revive and we expect the auto intelligent systems business to grow 50%.

3.2 New intelligent product: grasp the opportunity of AIoT

New intelligent products have a wide range of types, and there are numerous customers in this field. BYDE's new intelligent product business mainly focuses on **providing all or part of the design, structural parts and system assembly.** Major customers include NVIDIA, Razer, Google, Amazon, iRobot, etc. The product types include graphics cards, game books, smart speakers, sweeping robots, commercial POS machines and more. The gross profit margin of the business is currently about 10%.

Fig.31 Customers and representative products of BYDE's new intelligent products business

Source: Company Disclosure, Industrial Securities

The technology reserves are abundant and the future direction is clear. The company has about 1,500 people in the R&D teams along with a compliant CE/FCC-certified laboratory, which is the earliest "China Mobile" certified enterprise cooperation laboratory. These talent pools help reduce R&D costs, shorten R&D cycles, and increase R&D output.

Business outlook: The revenue of company's new intelligent products in 2018 was 4.34 billion rmb, yoy+70%, accounting for 10.57% of the total revenue, and the gross margin is about 10%. The Group has achieved breakthroughs in globally renowned customers in the smart home, gaming, commercial and IoT sectors. We expect that the revenue of this business to grow 45% in 2019.

4 Financial forecast and Valuation

4.1 Financial forecast

The main hypotheses and results of financial forecasts are as followed:

Tab. 5 BYDE's revenue breakdown

Revenue (Rmb, mn)	2016A	2017A	2018A	2019E	2020E	2021E
Total revenue	**36,734**	**38,774**	**41,047**	**50,744**	**57,058**	**60,846**
yoy		***5.6%***	***5.9%***	***23.6%***	***12.4%***	***6.6%***
Phone & NB			35,517	42,666	46,871	49,015
yoy				*20.1%*	*9.9%*	*4.6%*
Component			18,012	20,785	22,802	24,464
Metal			13,400	13,266	13,399	13,533
yoy				*-1.0%*	*1.0%*	*1.0%*
Plastic			3,100	4,495	5,169	5,428
yoy				*45.0%*	*15.0%*	*5.0%*
Glass+Ceram			1,512	3,024	4,234	5,504
yoy				*100.0%*	*40.0%*	*30.0%*
Assembly			17,505	21,881	24,069	24,551
yoy				*25.0%*	*10.0%*	*2.0%*
New intelligent products		2,553	4,340	6,293	7,866	9,046
yoy			*70.0%*	*45.0%*	*25.0%*	*15.0%*
Auto intelligent systems		476	1,190	1,785	2,321	2,785
yoy			*150.0%*	*50.0%*	*30.0%*	*20.0%*
Gross profit	**2,800**	**4,264**	**4,172**	**4,760**	**5,408**	**5,961**
GP Margin	***7.6%***	***11.0%***	***10.2%***	***9.4%***	***9.5%***	***9.8%***
Phone & NB			3,562	3,916	4,342	4,722
GP Margin			*10.0%*	*9.2%*	*9.3%*	*9.6%*
Component			3,422	3,741	4,150	4,526
GP Margin			*19.0%*	*18.0%*	*18.2%*	*18.5%*
Assembly			140	175	193	196
GP Margin			*0.8%*	*0.8%*	*0.8%*	*0.8%*
New intelligent products			434	629	787	905
GP Margin			*10.0%*	*10.0%*	*10.0%*	*10.0%*
Auto intelligent systems			119	214	278	334
GP Margin			*10.0%*	*12.0%*	*12.0%*	*12.0%*

Source: Company Disclosure, Industrial Securities

Tab. 6 BYDE's P&L

P&L (Rmb mn)	2016A	2017A	2018A	2019E	2020E	2021E
Total revenue	36,734	38,774	41,047	50,744	57,058	60,846
Cost of sales	-33,934	-34,510	-36,875	-45,984	-51,650	-54,885
Gross profit	2,800	4,264	4,172	4,760	5,408	5,961
GP margin	*7.62%*	*11.00%*	*10.16%*	*9.38%*	*9.48%*	*9.80%*
Other income and gains	474	493	558	569	581	592
Government grants and subsidies	26	240	287	296	305	314
R&D costs	-979	-1,201	-1,589	-1,624	-1,712	-1,765
R&D costs /total revenue	*-2.66%*	*-3.10%*	*-3.87%*	*-3.2%*	*-3.0%*	*-2.9%*
Selling and distribution costs	-185	-229	-229	-283	-319	-340
Selling expenses /total revenue	*-0.50%*	*-0.59%*	*-0.56%*	*-0.6%*	*-0.6%*	*-0.6%*
Administrative expenses	-562	-434	-536	-660	-742	-791
Administrative expenses /total revenue	*-1.53%*	*-1.12%*	*-1.31%*	*-1.3%*	*-1.3%*	*-1.3%*
Financial assets impairment			-57			
Other expenses	-114	-98	-28	-28	-29	-29
Finance costs	-27	-44	-43	-47	-49	-51
Profit before tax	1,433	2,992	2,536	2,983	3,443	3,892
Income tax expense	-200	-407	-347	-418	-482	-545
Income tax expense /Profit before tax	*-13.93%*	*-13.61%*	*-13.69%*	*-14.0%*	*-14.0%*	*-14.0%*
NI attr. To owners of the parent	1,233	2,585	2,189	2,565	2,961	3,347
Net margin	*3.36%*	*6.67%*	*5.33%*	*5.06%*	*5.19%*	*5.50%*
yoy	*35.83%*	*109.56%*	*-15.33%*	*17.21%*	*15.41%*	*13.04%*
Basic & Diluted EPS	0.55	1.15	0.97	1.14	1.31	1.49
Weighted Avg. Shares - Basic & Diluted	2,253	2,253	2,253	2253	2253	2253

Source: Company Disclosure, Industrial Securities

4.2 Valuation and rating

We expect the company's revenue in 2019/20/21 to reach 50.7/57.1/60.8 billion CNY, yoy+23.6%/+12.4%/+6.6%, and net profit to reach 2.57/2.96/3.35 billion CNY, yoy+17.2% /+15.4%/+13.0%. We set our target price at 16.0 HKD based on 12x 2019 PE. Considering the uncertainty of price competition, we initiate coverage with an "Outperform" rating.

5 Potential Risks

1) Domestic mobile phone shipments continue to decline;

2) 3D glass and ceramics demand may miss expectation;

3) Price competition of metal casing and parts.

Appendix

Balance Sheet				Mn/CNY
FY	2018A	2019E	2020E	2021E
Current Assets	**17,089**	**22,702**	**26,677**	**30,847**
Cash and Cash Equivalent	4,741	5,100	6,938	9,848
Prepayment	368	368	368	368
Account Receivables	7,209	11,164	12,553	13,386
Inventory	4,768	6,070	6,818	7,245
Other current assets	3	0	0	0
Non-current Assets	**8,962**	**9,562**	**9,507**	**8,932**
PPE	7,634	8,339	8,384	7,809
Goodwill and Intangible Assets	14	14	14	14
Prepayment Land lease	381	381	381	381
Long-term equity investment				
Sellable investment	0	0	0	0
Other non-current assets	933	827	727	727
Total Assets	**26,051**	**32,263**	**36,184**	**39,779**
Current Liabilities	**10,062**	**14,125**	**15,599**	**16,440**
Short-term Loan				
Trade payables	7,892	11,956	13,429	14,270
Other current liabilities	2,170	2,170	2,170	2,170
Non-current Liabilities	**164**	**164**	**164**	**164**
Long-term Loans				
Other non-current liabilities	164	164	164	164
Total Liabilities	**10,226**	**14,290**	**15,763**	**16,604**
Share Capital	4,052	4,052	4,052	4,052
Reserves	11,773	13,899	16,347	19,101
Equity attributable to owners of parent company	15,825	17,951	20,399	23,153
Equity of minority shareholders	0	0	0	0
Total Shareholders' Equity	**15,825**	**17,951**	**20,399**	**23,153**
Total Liabilities and Equity	**26,051**	**32,241**	**36,162**	**39,757**

Cash Flow Statement				Mn/CNY
FY	2018A	2019E	2020E	2021E
Net Profit	2,189	2,565	2,961	3,347
D&A	1,926	1,295	1,455	1,575
Change in Working Capitals	350	-1,610	-1,146	-964
Other adjustment	317	465	531	596
Cash Flows from Operating Activities	**4,781**	**2,714**	**3,801**	**4,553**
Cash Flows from Investment Activities	**-2,292**	**-1,870**	**-1,400**	**-1,000**
Cash Flows from Financing Activities	**-561**	**-486**	**-562**	**-643**
Net Change in Cash	1,928	358	1,839	2,910
Beginning Balance of Cash	2,822	4,741	5,100	6,938
Ending Balance of Cash	4,741	5,100	6,938	9,848

Income Statement				Mn/CNY
FY	2018A	2019E	2020E	2021E
Revenue	**41,047**	**50,744**	**57,058**	**60,846**
Cost	-36,875	-45,984	-51,650	-54,885
Gross Profit	**4,172**	**4,760**	**5,408**	**5,961**
Selling Expense	-229	-283	-319	-340
R&D Expense	-1,589	-1,624	-1,712	-1,765
G&A Expense	-536	-660	-742	-791
Financial cost	-43	-47	-49	-51
Other Expense	818	837	857	877
Income before Tax	**2,536**	**2,983**	**3,443**	**3,892**
Income Tax	-347	-418	-482	-545
Net Profit	2,189	2,565	2,961	3,347
Non-controlling Interest				
Net Profit Attributable to Owners of Parent Company	**2,189**	**2,565**	**2,961**	**3,347**
EPS(CNY)	**0.97**	**1.14**	**1.31**	**1.49**

Key Financial Ratio				
FY	2018A	2019E	2020E	2021E
Growth				
Growth Rate of Revenue	5.9%	23.6%	12.4%	6.6%
Growth Rate of Gross Profit	-24.2%	20.6%	20.2%	16.3%
Growth Rate of Net Profit	-15.3%	17.2%	15.4%	13.0%
Profitability				
Gross Margin	10.2%	9.4%	9.5%	9.8%
Net Profit Margin	5.3%	5.1%	5.2%	5.5%
ROE	13.8%	14.3%	14.5%	14.5%
Solvency				
Asset-liability Ratio	39.3%	44.3%	43.6%	41.7%
Current Ratio	1.70	1.61	1.71	1.88
Quick Ratio	1.22	1.18	1.27	1.44
Operation Capacity				
Asset Turnover Ratio	1.58	1.57	1.58	1.53
Receivable Turnover Ratio	5.69	4.55	4.55	4.55
Stock Info(CNY)				
EPS	0.97	1.14	1.31	1.49
OCFPS	-1.02	-0.83	-0.62	-0.44
NAVPS	7.02	7.97	9.05	10.28
Valuation Ratio				
PE	12.7	10.8	9.4	8.3
PB	1.76	1.55	1.36	1.20

Introduction of Share Investment Rating

Industry Investment Rating

When measuring the difference between the markup of the industry index and that of the market's benchmarks (Shanghai Composite Index/Shenzhen Part Index) within twelve months after the release of the report, we define the terms as follows:

- **Overweight**：Industry performs better than that of the whole market；
- **Neutral**：Industry performs about the same as that of the whole market；
- **Underweight**：Industry performs worse than that of the whole market

Company Investment Rating

When measuring the difference between the markup of the company stock price and that of the market's benchmarks (Shanghai Composite Index/Shenzhen Part Index) within twelve months after the release of this report, we define the terms as follows:

- **Buy**： With a markup more than 15% better than that of the market；
- **Outperform**：With a markup 5% to 15% better than that of the market；
- **Neutral**： With a markup less than 5% better or worse than that of the market；
- **Underperform**： With a markup more than 5% worse than that of the market.

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