

AIChip | Asia Pacific

AIChip's 7nm projects take off to secure exponential growth in 2022, Initiate OW

Stock rating

Over-weight

Target Price

NT\$ 1,176.0

Key Positive Thesis

ASIC will become a mainstream component for HPC:

ASIC is estimated to become the dominant type of application for HPC chips. As of 2022, customers' demand still far exceeds AIChip's capacity. As all AI applications require training & inference processes. Training refers to building models by using a machine-learning algorithm to build models. Inference refers to the process of using a trained machine-learning algorithm to make a prediction. ASIC is expected to provide superior performance in computing performance.

7nm process node provides unique competitive advantages:

AIChip has confirmed to complete the 5nm and 7nm server CPU projects in 2021. Crucial customers for 7nm project include Amazon and Habana (an Intel's subsidiary). There are three outstanding 7nm AI chip projects (from AWS), with 2 of them starting revenue contributions as early as 4Q21. These projects will become the main growth drivers for FY22. In 2021, 60% of the total revenue of AIChip (Including NRE & Turnkey Solutions) was contributed from 7nm process node projects, which yield NT\$ ~6.3B. This helps AIChip consolidate its market leadership in any high-end chip production project in the Greater China region.

Exhibit 1: AIChip holds significant advantages in tech nodes under 7nm over its semi-IP design competitors

Tech Nodes	AIChip	GUC	Faraday
<28nm (NT\$ mn)	9740.0	9389.2	1056.7
<7nm (NT\$ mn)	6267.4	2919.1	<1000
<7nm/ <28nm (%)	64%	31%	n.a.

Source: Investor Relations of AIChip, GUC and Faraday

Exhibit 2: Valuation of AIChip & Peers as of 2022/4/15 (By Reporting Currency)

Company	Ticker	Repo Cur	Last Price	Mkt Cap (m)	EV (m)	Net Debt (m)	Share Out (m)
ALCHIP TECH	3661 TT	TWD	925	65,899	57,685	-8,214	71
GUC	3443 TT	TWD	458	61,310	53,864	-7,446	134
FARADAY	3035 TT	TWD	266	65,990	61,736	-4,254	249
RAMBUS INC	RMBS US	USD	26	2,852	2,566	-287	110
CEVA INC	CEVA US	USD	35	810	663	-146	23
SYNOPSYS	SNPS US	USD	295	45,129	44,441	-688	153
CADENCE	CDNS US	USD	150	41,701	41,092	-609	278

Source: CUIRS

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AIChip (3661.TW)

Stock Rating	Over-weight
Target Price	NT\$ 1176.0
Shr price (15/04/22)	NT\$925.0
Up/downside (%)	27.1%
52-Week Range	NT\$363.50-1325.00
Shares Out. (mn)	70.4 mn
Mkt Cap (TWD mn)	NT\$ 65,899
EV (TWD mn)	NT\$57,685

Fiscal year (12/31)

(NT\$ mn)	2021A	2022E	2023E
Revenue	10428	15348	21150
YoY (%)	47%	47%	38%
Gross Profit	3563	5229	7245
GPM	34%	34%	34%
EBIT	1828	2869	4267
OPM (%)	17.5%	18.7%	20.2%
PBT	1901	2942	4340
Net Income	1490	2305	3401
NPM	14.3%	15.0%	16.1%
Basic EPS	21.3	33.0	48.7

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Key Positive Thesis (Cont.)

China's localization of Semiconductors :

The adoption of local source and open-source technology (RISC-V) is being actively encouraged by the Chinese government. The Chinese semiconductor industry is also reducing imports of US CPU & GPU to mitigate the impacts of potential sanctions by the US. China's semiconductor companies were inexperienced yet lack the necessary technologies to catch up with development in <16nm process nodes. AIChip becomes an essential partner considering its 7nm and 5nm design sophistication.

Orders from Phytium under recovery:

Phytium was one of the most important customers of AIChip before being put into US' Entity List in Apr 2021, and the trading relationship was suspended.

AIChip is continuing its effort to apply for the US government's permission to export produced chips to Phytium, as implied by the management.

Phytium has 3 outstanding projects with AIChip, namely 1) 16nm PC CPU, 2) 16nm server CPU and 3) 7nm PC/server CPU.

We understood the US took a selective approach when considering semiconductor exports to China. We have made a list of the US government's decision regarding semiconductor exports in recent years. The US tended to permit the export of PC CPU but not the server CPU. Based on the same principle, we believe the US government will adopt similar practices regarding Phytium's export approval. Our conservative estimate indicates that only 16nm PC CPU is very likely to be permitted for export, while the 16nm server CPU and 7nm projects will still be put on hold. The impact of the production recovery will be reflected on 2H22 revenue according to management's implication in the 4Q21 earning call.

Exhibit 3: List of US government's approval for semiconductor exports to Chinese companies on the Entity List

Affected Company	Product line/Service	Semi Vendors	Semi components	US License Status	
Huawei	Smartphone	MediaTek	4G SoC	Yes	
			5G SoC	No	
		Qualcomm	4G SoC	Yes	
			5G SoC	No	
		Skyworks	Legacy RF	Yes	
			5G RF	No	
		Qorvo	Legacy RF	Yes	
	5G RF		No		
	PC	Well Semi/OmniVision	SONY	Image sensor	Yes
			Well Semi/OmniVision	Image sensor	Yes
			Intel	CPU	Yes
		AMD	AMD	CPU	Yes
			RealTek	Pc WiFi	Possible
Infineon			Power semis	No	
Base Station	Vishay	Power semis	No		
		Intel	CPU	No	
Server	AMD	CPU	No		
		CPU	No		
SMIC	Wafer Foundry	US Equipment vendors	Wafer fab on-site service	Yes	
			mature nodes wafer fab equipment	Partial	
			Sub-10nm wafer fab equipment	No	
Phytium	CPU Design	EDA tool (Synopsys, Cadence etc.)	PC/server CPU	Pending	
		TSMC	PC/Server CPU	Pending	

Source: CUIRS, Sell-Side Researches

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Key Negative Thesis

ABF substrate - the key bottleneck for growth potential:

ABF substrate, one of the key packaging materials for HPC (data center) chips, is facing shortage in supply. ABF substrate has computing efficiency and therefore the optimal parts for advanced level chips (chips for AI, 5G, big data, computing). This capped the production volume of fast-growing HPC chips and potentially hurt AIChip's revenue in 2022.

US sanctions on Phytium and Hunan Goke are not fully lifted :

Phytium is the major contributor to AIChip's revenue. (39% rev. contribution in FY20). Hunan Goke was also banned for its affiliation with the Liberation Army of China in Nov 2021. This may signal the US intends to expand its restrictions on more high-level AI projects, which may threaten AIChip's other customers.

Major Customers become direct accounts under TSMC:

Customers may cease to outsource design duties to Phytium once major customers' chip production starts ramping up or its design capabilities become sophisticated. They may turn to TSMC directly for chip production. In the short term, this scenario is not likely as AIChip remains value-adding to Chinese semiconductor brands given its time-to-market and high-quality design.

Fulfillment rate of turnkey demand remains low:

The fulfillment rate of turnkey (one-stop solution of design + production) demand is only 50% as of 4Q21. If the situation does not improve, lower revenue will be recognised in the short run.

Exhibit 4: Disclosed Key Customers in 2021

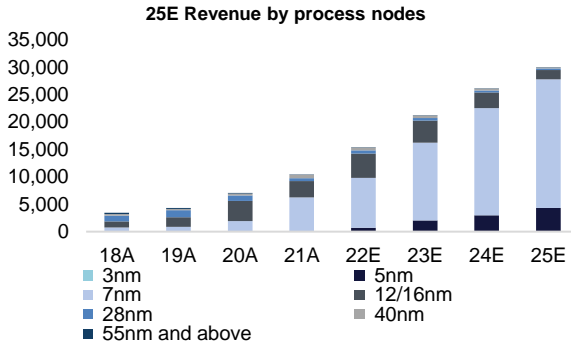
Companies	Outstanding Projects	Notes
Phytium (天津飛騰)	- 16nm PC CPU, 16 server CPU & 7nm node projects	- Currently listed in the US Entity List. AIChip is unable to provide any services
Hunan Goke (湖南國科微電子)	- Undisclosed	- Currently listed in the US Entity List. AIChip is unable to provide any services - Contributed 30% revenue in 1H21
Amazon	- 16nm AWS Inferentia Chip project	- Production & revenue contribution begins in 4Q21
Habana (Intel's subsidiary)	- 7nm Goya AI Chip	- Production and revenue contribution begins in 4H21

Source: CUIRS

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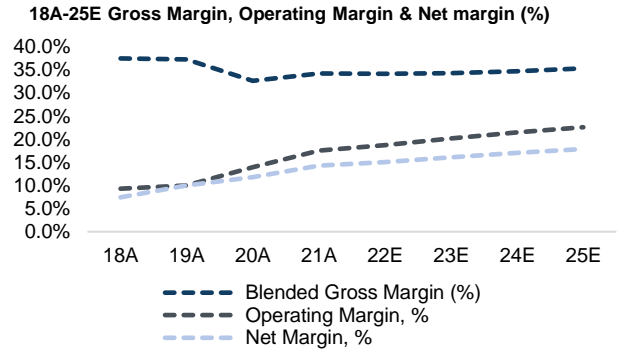
Financial Forecast (Cont.)

Exhibit 5: We expect 25E revenue approach NT\$ 32.1B, with 7nm being the major contributor



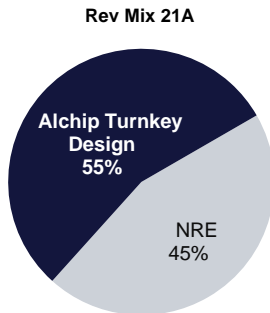
Source: CUIRS

Exhibit 6: AIChip's GPM, OPM and NPM in 2018A-2025E

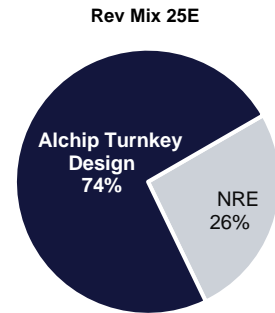


Source: CUIRS

Exhibit 7: 18A-25E AIChip's revenue mix by service type 2021A-2025E
AIChip Turnkey Design will become the major services in 2025

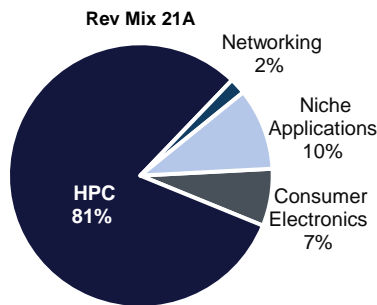


Source: CUIRS

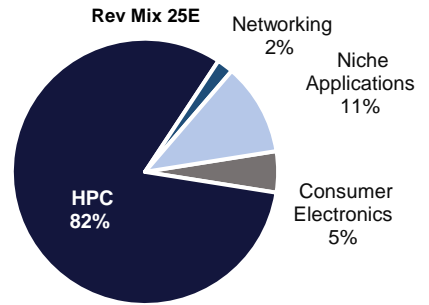


Source: CUIRS

Exhibit 8: AIChip's revenue breakdown by applications 2021A – 2025E
Chips for HPC use remains the major contributor of AIChip's orders

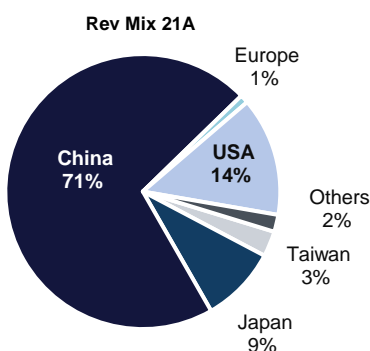


Source: CUIRS

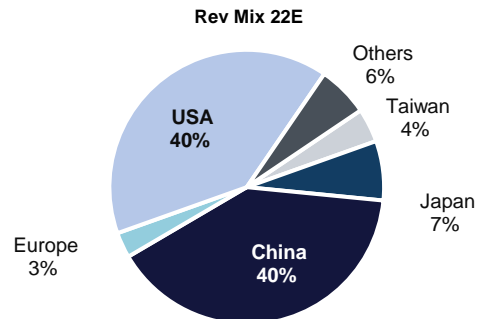


Source: CUIRS

Exhibit 9: AIChip's revenue breakdown by geographic location 2021A – 2022E
USA has taken over to become the major customer of AIChip along with China



Source: CUIRS



Source: CUIRS

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Financial Forecast (Cont.)

Exhibit 10: AIChip's income statement forecast : 2020A – 2025E

Income Statement (NT\$ mn)

	20A	21A	22E	23E	24E	25E
Revenue	7,079	10,428	15,348	21,150	26,497	30,538
Cost of Good Sold	(4,772)	(6,866)	(10,118)	(13,904)	(17,313)	(19,767)
Gross Profit	2,307	3,563	5,229	7,245	9,184	10,772
SG&A	(534)	(739)	(921)	(1,100)	(1,192)	(1,222)
R&D	(784)	(989)	(1,151)	(1,480)	(1,802)	(2,077)
D&A	(80)	(98)	(144)	(199)	(249)	(287)
Provision for Doubtful Asset	(2)	(6)	-	-	-	-
Other OPEX	80	(98)	(144)	(199)	(249)	(287)
Operating Income	987	1,828	2,869	4,267	5,692	6,899
Non-Operating P&L	92	73	73	73	73	73
Pretax Income (Loss), Adjusted	1,079	1,901	2,942	4,340	5,764	6,972
Abnormal P&L	6	-	-	-	-	-
Pretax Income (Loss), GAAP	1,086	1,901	2,942	4,341	5,765	6,973
Income Tax (Expense)/Income	(251)	(411)	(637)	(939)	(1,248)	(1,509)
Income (Loss) Incl. MI	835	1,490	2,305	3,401	4,517	5,464
Minority Interest	-	-	-	-	-	-
Net Income, GAAP	835	1,490	2,305	3,401	4,517	5,464
Basic Weighted Avg Shares	61.3	69.8	69.8	69.8	69.8	69.8
Basic EPS, GAAP	13.6	21.3	33.0	48.7	64.7	78.3

Growth & Margin (%)

	20A	21A	22E	23E	24E	25E
Total Revenue YoY (%)	63%	47%	47%	38%	25%	15%
EPS Growth YoY (%)	89%	57%	55%	48%	33%	21%
Blended Gross Margin (%)	33%	34%	34%	34%	35%	35%

Implied Multiples (x) under target price

	20A	21A	22E	23E	24E	25E
P/E (x)	98.5x	55.2x	35.7x	24.2x	18.2x	15.1x
P/S (x)	11.6x	7.9x	5.4x	3.9x	3.1x	2.7x
EV/Sales (x)	10.3x	7.0x	4.8x	3.5x	2.8x	2.4x
EV/GP (x)	31.7x	20.5x	14.0x	10.1x	8.0x	6.8x
EV/EBIT (x)	74.1x	40.0x	25.5x	17.1x	12.9x	10.6x

Source: CUIRS

We model AIChip's revenue growth at 47% YoY, with a 5-year CAGR growth of 30.8% in FY21A to FY25E.

AIChip's revenue growth will mainly be driven by its increasing 7nm projects in FY22E. AIChip currently holds 30+ ongoing & pipeline business and the majority of them are 7nm projects. 7nm projects will continue to become the major driver of AIChip top-line revenue in FY22E. **7nm projects will grow by 46% YoY, constituting 60% of total revenue.** Based on management implications, businesses with Phytium is expected to continue in FY22. According to our estimate, **16nm CPU projects are very likely to resume in FY22.** We will see **49% YoY revenue growth** contributed by **12/16nm chips in FY22E(29% of sales revenue).** (For details, please refer to P.2).

It is noted that ABF **substrate shortage** continued to affect chip production. It was expected AIChip's **fulfilment rate of 7nm chip project can only reach 50%** at most. It was led by shortage in ABF substrate, which will probably be resolved in 2H22 or 2023 based on management's implication. Its impact will probably linger till 2023 when the unfulfilled orders are completed. **2023E revenue growth is therefore adjusted to be 38% YoY, while 7nm projects growing by 55% YoY (2022E: 46% YoY).**

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Financial Forecast (Cont.)

We forecast AIChip's **gross margin** will be largely intact at **34.1%** in FY22E (FY21: 34.2%). **TSMC increased its wafer price by 20%** ([Link](#)) and **substrate for chip production** is in shortage ([Link](#)). AIChip pricing scheme is based on the **cost+margin** pattern. Raw material shortage did drag down the growth of 2022E revenue growth. But AIChip is in active negotiation with clients, who are mainly large tech corporates (AWS, Habana, Baidu etc.) willing to pay for higher price. **AIChip can pass on the increasing cost to clients and therefore maintain its Gross Margin level in FY22E.**

SG&A expense are expected to increase due to expansion in total employee size. AIChip announced its plan to expand the total employee size (**FY21: ~500**) by **20% to 600** employees in 4Q21 earning call. We forecast the **SG&A expense** will rise by **24.5% YoY** to accommodate the additional 20% employees in FY22E.

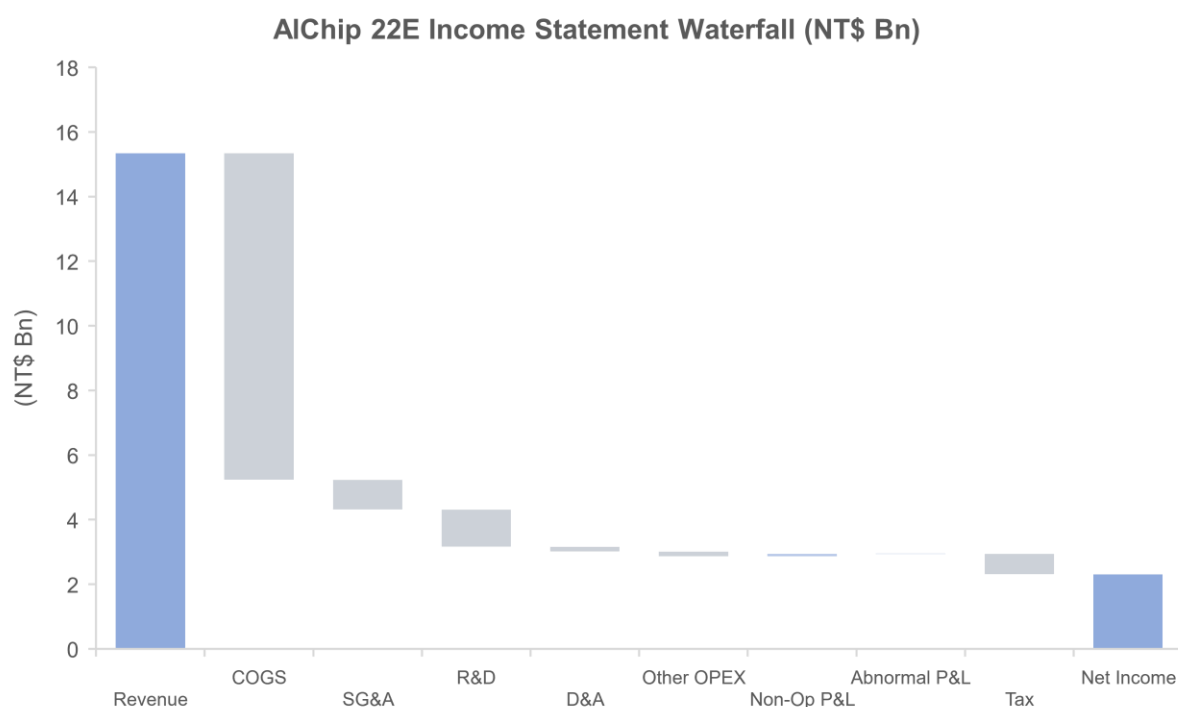
R&D Expense will also be likely to increase by **16.3% YoY** following the beginning of 3nm and 5nm project research. AIChip will kickstart its first 3nm project and is expected to tape out in early FY24. As for 5nm node, there are multiple outstanding 5nm projects. R&D/Sales ratio is expected to drop to 7.5% (FY21: 9.5%) due to exponential growth in top-line revenue.

Exhibit 11: AIChip's revenue forecast – 2018A-2023E

	2018	2019	2020	2021	2022	2023
Consensus						
Sales	3450.7	4332.0	7078.9	10428.3	14637.7	20606.3
Net Income	257.4	433.5	834.9	1489.7	2250.3	3330.0
EPS	4.2	7.2	13.6	21.3	31.7	46.6
CUIRS Estimate						
Sales	3450.7	4332.0	7078.9	10428.3	15347.6	21149.6
Net Income	257.4	433.5	834.9	1489.7	2305.2	3401.3
EPS	4.2	7.2	13.6	21.3	33.0	48.7
CUIRS Earning Surprise % (FY22E)						
Sales			NM	NM	4.85%	NM
Net Income			NM	NM	2.44%	NM
EPS			NM	NM	4.18%	NM

Source: CUIRS

Exhibit 12: AIChip's FY22E Waterfall Chart (NT\$ Bn)



Source: CUIRS

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Valuation

#1 Relative Valuation – TP NT 1,176 per Share

We used FY+1 forward P/E as the methodology of relative valuation. The main reason for this decision is that the P/E ratio is suitable for mature company which had already reached profitability for years.

To forecast the 12-month target price (until FY22), we **applied a FY+1 P/E** and multiplied it by FY22E EPS

To determine the reasonableness of our multiples applied, we compare our FY22E EPS with the consensus estimate and see by how much our estimate beats (or be beaten by) the consensus (coined as **EPS surprise %**). We then checked historical data, singled out periods where the actual EPS beat consensus by similar level as our EPS surprise % estimate. We eventually observed correspondingly by how much the FY+1 P/E will go up and justified the P/E multiples applied.

We have also selected 6 comparable companies **to determine the potential upside and downside cases..** The companies used as benchmark are : Global UniChip (GUC), Faraday Tech, Rambus Inc, Ceva Inc, Synopsys Inc. and Cadence Design. All companies are AIChip's competitors in Semi-IP design or EDA suppliers of AIChip.

Exhibit 13: AIChip and comparable company's P/E level : 2021A-2023E

Multiples Years	P/E		
	21A	22E	23E
ALCHIP TECH	45.6x	30.2x	20.4x
GLOBAL UNICHIP	42.2x	32.5x	26.0x
FARADAY TECH	60.4x	28.6x	28.5x
RAMBUS INC	155.7x	16.9x	15.7x
CEVA INC	52.6x	40.7x	33.2x
SYNOPSYS INC	41.3x	39.3x	32.2x
CADENCE DESIGN	47.1x	41.1x	36.0x

Source: CUIRS

Exhibit 14: AIChip and comparable company's P/E level : 2021A-2023E

Outputs Years	Sales Growth YoY (%)			Net Margin (%)		
	21A	22E	23E	21A	22E	23E
ALCHIP TECH	47%	40%	41%	14%	15%	16%
GLOBAL UNICHIP	11%	22%	16%	10%	10%	11%
FARADAY TECH	47%	59%	9%	14%	19%	17%
RAMBUS INC	33%	56%	7%	6%	33%	33%
CEVA INC	22%	17%	12%	12%	14%	15%
SYNOPSYS INC	20%	10%	13%	27%	25%	27%
CADENCE DESIGN	11%	12%	11%	31%	31%	32%

Source: CUIRS

Exhibit 15: Min, Median and Max of AIChip and comparable company's P/E level: 2019A-2021A

Simple AVG Excluding Target

Max	14.3x	12.7x	11.5x	155.7x	41.1x	36.0x
Q3	11.7x	10.6x	9.4x	84.2x	40.8x	33.9x
Median	8.0x	5.1x	4.7x	49.8x	35.9x	30.3x
Q1	4.9x	4.2x	3.7x	42.0x	25.7x	23.5x
Min	3.6x	2.9x	2.5x	41.3x	16.9x	15.7x

Source: CUIRS

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Valuation (Cont.)

#1 Relative Valuation – TP NT 1,176 per Share

1) FY+1 P/E multiples:

The median of FY+1 P/E ratio across 2 years stood at 30.3x. The standard deviation of AIChip's 2Y FY+1 P/E ratio is 5.3x.

Our FY22E EPS beats the consensus by **4.18%**. We have checked historical data across AIChip's recent 2 years and noticed there were 6 times the quarterly EPS result beating the consensus. The 2Y historical surprise % lied between 1.59% to 3.31%. 4 out of 6 times AIChip's FY+1 P/E ratio gradually re-rated to **35.6x (2Y average+ 1SD)**.

Given the fact that we estimated the FY22 EPS will beat consensus by 4.18%, larger than the EPS surprise happening across these 2 years, we forecast it is very likely AIChip's FY+1 P/E ratio can touch 35.6x by the end of FY22. Details will be explained in the next page.

Though in fundamental analysis, this is a simple assumption and it can not fully represent the market dynamic, we do see AIChip's potentials to outgrow the consensus estimate. It can signal to the market on its long-term growth story, and therefore being rated at higher valuation level.

Exhibit 16: AIChip and comparable company's P/E level – 2021A-2023E

P/E Framework

Based on 2022 EPS

	PE (x)	EPS	TP	Return (%)
Upside	40.0x	34.7	1387	49.9%
Base	35.6x	33.0	1176	27.1%
Downside	25.7x	28.8	741	-19.9%

Exhibit 17: AIChip forward 1Y P/E level : 2020 March - 2022 April

3661 TT Best Forward 1 yr P/E Band

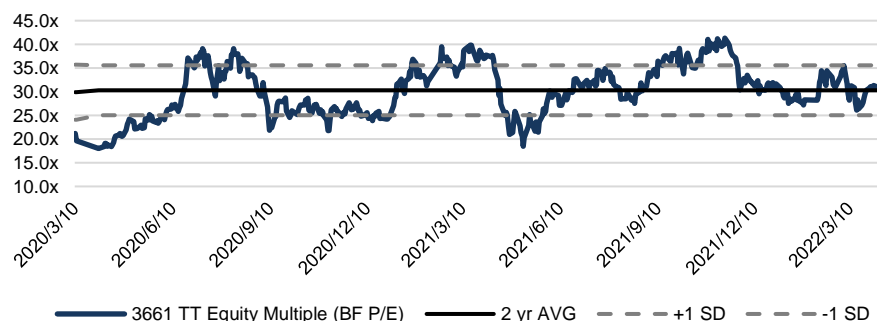


Exhibit 18: Market forecast consensus on AIChip and comparable companies

Metrics	Sales (US\$ mn)			Sales YoY			Gross Margin			EBITDA Margin			EBIT Margin			Net Margin			
	21A	22E	23E	21A	22E	23E	21A	22E	23E	21A	22E	23E	21A	22E	23E	21A	22E	23E	
Forecast Year																			
ALCHIP TECH	TWD	359	504	709	47%	40%	41%	34%	34%	30%	29%	28%	18%	19%	19%	14%	15%	16%	
GUC	TWD	520	633	737	11%	22%	16%	35%	34%	35%	15%	16%	11%	12%	13%	10%	10%	11%	
FARADAY	TWD	278	442	483	47%	59%	9%	50%	50%	48%	18%	23%	25%	17%	23%	22%	14%	19%	17%
RAMBUS INC	USD	11	18	19	33%	56%	7%	79%	86%	85%	74%	51%	51%	7%	44%	44%	6%	33%	33%
CEVA INC	USD	4	5	6	22%	17%	12%	86%	83%	83%	20%	NM	NM	3%	18%	19%	12%	14%	15%
SYNOPSIS	USD	152	166	188	20%	10%	13%	81%	81%	82%	35%	34%	38%	20%	30%	34%	27%	25%	27%
CADENCE	USD	103	116	128	11%	12%	11%	91%	91%	91%	41%	42%	43%	26%	38%	40%	31%	31%	32%
AVG Excl Alchip		178	230	260	24%	29%	11%	70%	71%	71%	34%	33%	35%	14%	28%	28%	17%	22%	23%

Multiples

Metrics	Forecast Year	P/S	EV/S	EV/GP	EV/EBITDA	EV/EBIT	P/E	21A			22E			23E					
								21A	22E	23E	21A	22E	23E	21A	22E	23E			
ALCHIP TECH	TWD	6.5x	4.6x	3.3x	5.7x	4.1x	2.9x	16.9x	12.1x	8.9x	19.1x	14.3x	10.4x	32.7x	21.6x	15.1x	45.6x	30.2x	20.4x
GUC	TWD	4.1x	3.3x	2.9x	3.6x	2.9x	2.5x	10.3x	8.5x	7.3x	23.7x	18.5x	15.5x	32.4x	24.8x	19.4x	42.2x	32.5x	26.0x
FARADAY	TWD	8.6x	5.4x	5.0x	8.1x	5.1x	4.7x	16.1x	10.2x	9.7x	45.4x	22.7x	18.7x	46.8x	22.1x	21.5x	60.4x	28.6x	28.5x
RAMBUS INC	USD	8.7x	5.6x	5.2x	7.8x	5.0x	4.7x	10.0x	5.8x	5.5x	10.6x	9.9x	9.2x	105.8x	11.4x	10.6x	155.7x	16.9x	15.7x
CEVA INC	USD	6.6x	5.6x	5.0x	5.4x	4.6x	4.1x	6.2x	5.5x	4.9x	26.4x	NM	NM	187.5x	26.1x	22.0x	52.6x	40.7x	33.2x
SYNOPSIS	USD	10.9x	10.0x	8.8x	10.8x	9.8x	8.7x	13.4x	12.1x	10.6x	30.7x	28.9x	22.6x	54.8x	32.3x	25.7x	41.3x	39.3x	32.2x
CADENCE	USD	14.5x	12.9x	11.6x	14.3x	12.7x	11.5x	15.6x	13.9x	12.6x	35.0x	30.0x	26.6x	54.7x	33.1x	29.0x	47.1x	41.1x	36.0x
AVG Excl Alchip		8.9x	7.1x	6.4x	8.3x	6.7x	6.0x	11.9x	9.3x	8.4x	28.6x	22.0x	18.5x	80.3x	25.0x	21.4x	66.5x	33.2x	28.6x

Source: CUIRS, Comps & PEBD Projected from Bloomberg Terminal

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Valuation Summary – TP NT\$ 1176.0 Per Share

To drive further scenario analysis under bull case/bear case, we think adopting current trending multiples is necessary to tie to the market dynamic and historical valuation movements.

Bull, Bear, Base scenarios under 22E P/E & EV/Sales Frameworks:

NT\$ 1387 Bull Case (+49.9% Upside):

Assume the company breaks consensus EPS by 5% (Implied NT\$ 34.7 22E EPS) with implied 22E P/E 40.0x, yielding Bull Case TP NT\$ 1387, equivalent to 49.9% upside. AIChip's FY+1 P/E peaked at 40.0x for 2 times throughout recent 2 years. We believe AIChip can maintain a 40.0x in FY22, given AIChip's robust overseas orders growth.

NT\$ 1176 Base Case (+27.1% Upside):

Assume the 2-Year historical performance holds, we implied a 35.6x FY+1 P/E. EPS estimates stood at 33.0. In 4 out of 6 times AIChip's EPS beat consensus, stock multiples are able to hike to 35.6x.

The results of the remaining 2 times didn't come off as expected due to justifiable reasons.

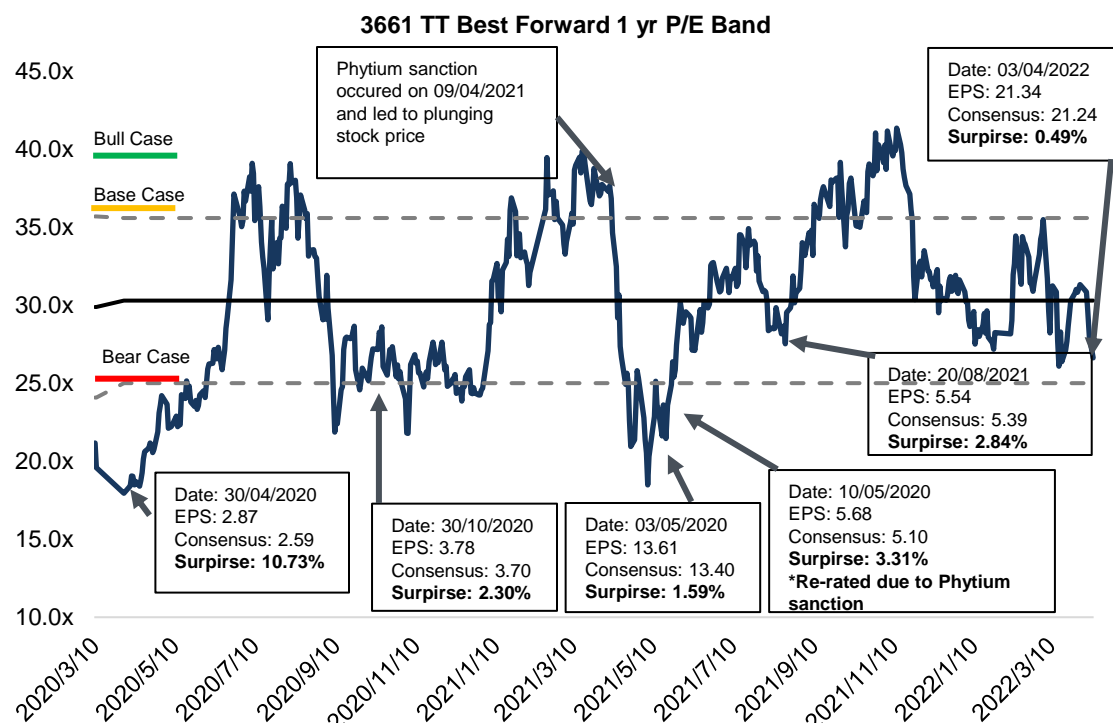
(30/04/2020: P/E was just at 25.0x and the market has just realized robust order growth from Chinese semiconductor firms

03/05/2020: Stock price are dragged down by the sanction on Phytium, by then the biggest customer of AIChip, despite beating consensus by 1.59%)

NT\$ 741 Bear Case (-19.9% Downside):

Assume EPS delivered lower than consensus by 5% (EPS 28.8 at FY22E), with 25.7x PE (1st quartile of peer groups' 2Y average FY+1 P/E), yielding Bear Case TP NT\$ 741, equivalent to -19.9% downside. We saw multiple times of rebound when AIChip's FY+1 P/E touched around 25.0x. Given HPC's technological upgrade demand in cutting edge process nodes, we believe the stock is unlikely to fall below this level.

Exhibit 19: AIChip's earning surprise and its effect on the FY+1 P/E multiples : 2020 March – 2022 April



Source: CUIRS, PEBD projected from Bloomberg Terminal

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Company introduction

Business Model and Product

AIChip consists of mainly 3 segments by company’s definition. Major application of ASIC & SoC is on high-resolution TV, telecommunication , consumer electrics (camera, bandwidth etc.) and niche market (supercomputer, bitcoin mining)

ASIC & Chip Production:

Provide customers with Non-Recurring Engineering (NRE) (**See below**) of Application Specific Integrated Circuit (ASIC) and System on Chip (SoC), as well as management of mass-production (coined as **turnkey solutions**). The turnkey solutions includes AIChip’s design services and collaborate with wafer foundry (TSMC), testing (ASE Group) and packaging house (Sigurd) to offer a usable chip for clients.

Non-recurring engineering (NRE):

Mainly provide the circuit design component database and all kinds of Silicon Intellectual Property (SIP) required by product design, produce circuit diagrams for mask process, and manufacture masks, wafer, cutting, and packaging on a consign basis and then deliver the trial production samples after doing product testing by our engineers.

AIChip partners with IP holders (eg ARM). AIChip is in charge of IP selection, qualification, and integration. Coupled with AIChip’s own IP design, which include double pattern technology, coloring, cut metal, 2.5D packaging etc., AIChip modify create an optimal chip design catering end users’ need.

Others:

Only provide customers with back-end wafer fabrication, packaging, and testing.

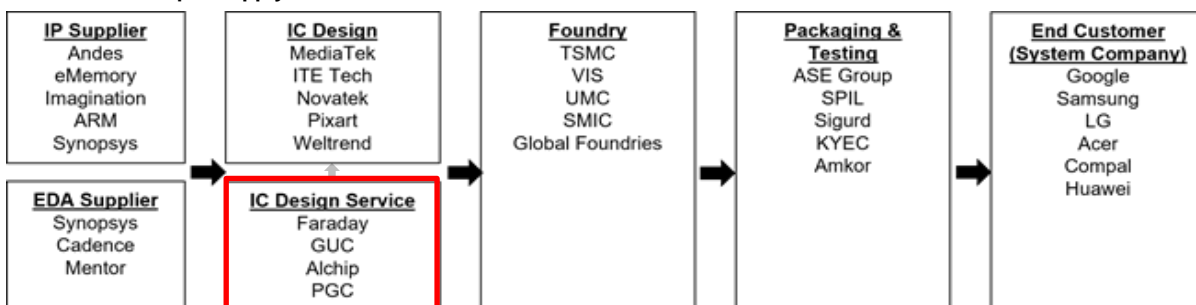
Supply Chain Position

AIChip’s provides design and production services to the end user of chips. AIChip’s major suppliers of technology are 1) Semi-IP holders (ARM, eMemory, M31 etc.) and 2) Electronic design automation software (Synopsys, Cadence etc.)

Once the design of chip is confirmed, end customers can choose either attain the design, or make request to AIChip for production service. Once AIchip is requested for production, Alchip will collaborate with 1) foundry factories (TSMC, Samsung, Globalfoundries) and 2) packaging & testing house (ASE Group, SPIL etc.) to make available-for-use chips.

End customers include Apple, Samsung, Google, Intel etc.

Exhibit 20: AIChip’s Supply Chain Position



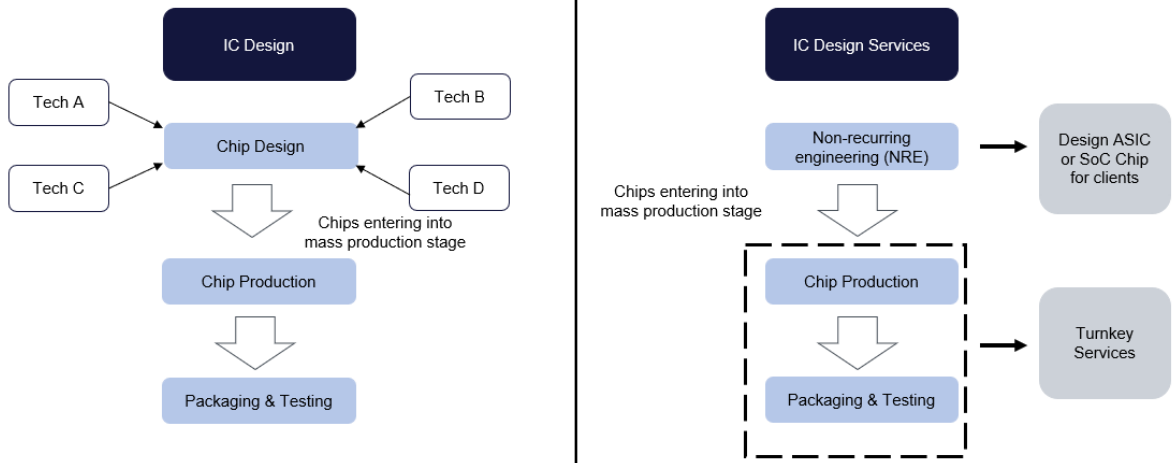
Source: AIChip Investor Relations, CUIRS

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Company introduction

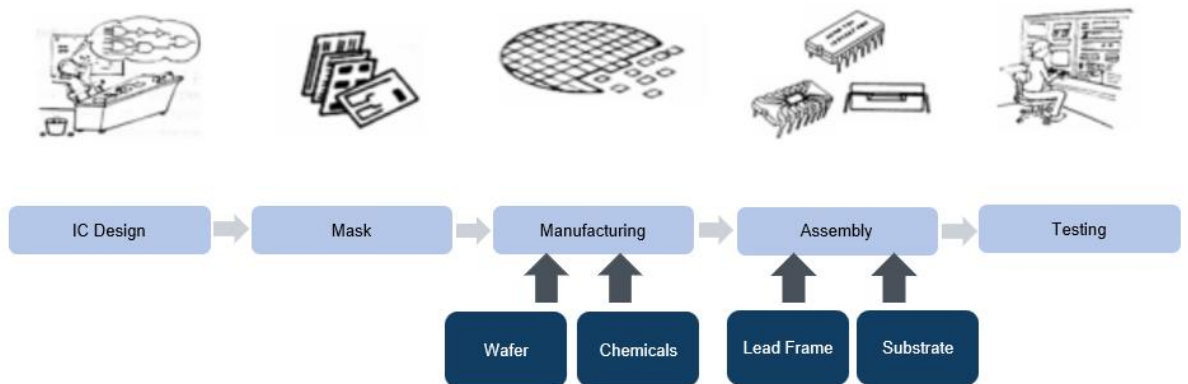
Business Model and Product

Exhibit 21: IC design vs IC design services difference



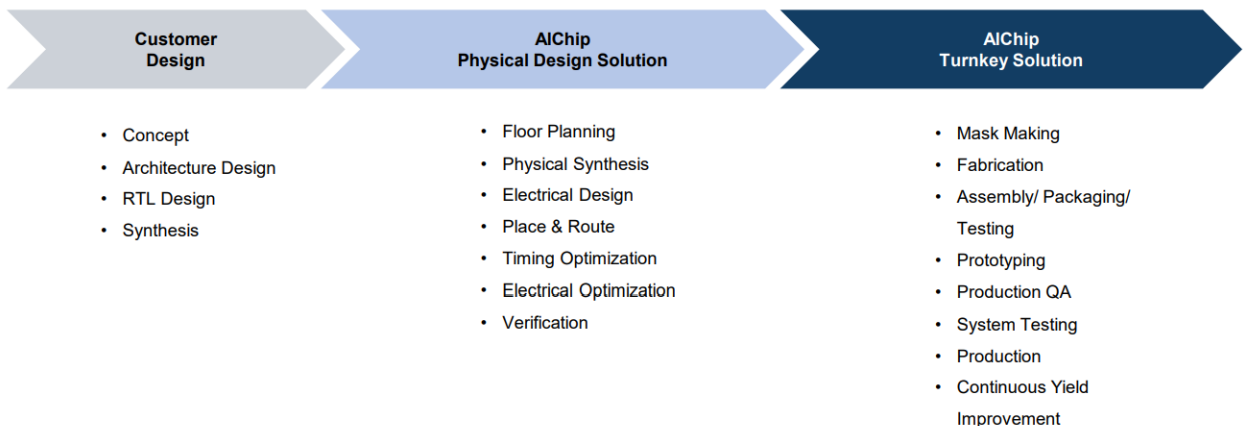
Source: MoneyDJ, CUIRS

Exhibit 22: Walkthrough of Normal Chip design process



Source: Televisory, CUIRS

Exhibit 23: Workflow of AIChip's service offerings



Source: AIChip Investor Relations, CUIRS

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Company introduction

Industry Quick Cap

Semi IP industry’s main offering is a reusable unit of logic, cell, or integrated circuit layout design that is the intellectual property of different designer companies. Semiconductor IP can be separated into 4 categories: 1) Processor (51%) ; 2) Interface IP (22%) ; 3) Digital IP (8%) ; 4) Other physical IP (19%)

Total Addressable Market and Future Growth

The integrated circuit market is expected to break through US\$ 500 bn until 2025. due to exponentially growing demand of 5G, AI, deep learning, VR, Data center & cloud computing.

Semi-IP market is expected to grow from USD 5.5b in 2021 to USD 7.2b by 2026, at a CAGR growth at 5.4% due to sophisticated technology node technology and modern SoC design.

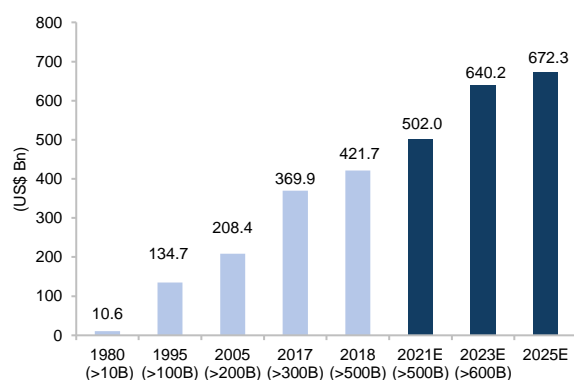
Commercialization of advanced technologies under 16nm is difficult for independent fabless manufacturers. Every 16nm chip is completed through EDA tools, photomask and Semi-IPs, which takes US\$10 million combined for production. Semiconductor startups or companies without integrated circuit background are not financially capable for substantial investment. Semiconductor design firms like AIChip therefore becomes an alternative of market entry to catch up sophisticated semiconductor players.

AIChip’s main offering is Application specific integrated circuit (ASIC). These chips are only be specifically used for one application for which they were designed.

ASIC’s main advantage is to reduce chip size as chips nowadays have a large number of functional units. 32-bit microprocessor, memory blocks and network circuits are compressed within a chip with the help of modern technology. Therefore modern day ASIC is also subbed as “system on chip” (SoC).

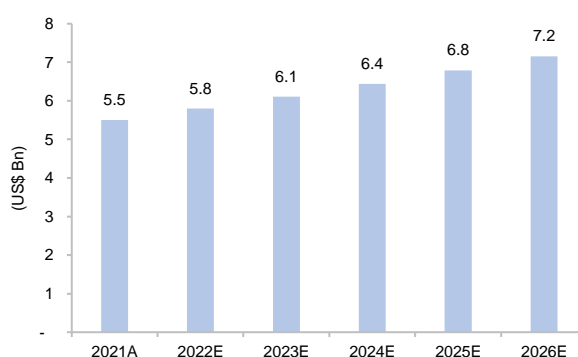
ASIC can be categorized into full custom IC and semi-custom IC. The circuits and mask layers for interconnection are fully customized by designers, while semi-custom IC make use of pre-designed semiconductor IPs to reduce time and cost.

Exhibit 24: Integrated Circuit market (US\$ Bn)



Source: IC Insights, CUIRS

Exhibit 25: ASIC market size 2016-2023E (US\$ Bn)



Source: Reportlinker.com, CUIRS

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Company introduction

Key Growth Factors for Semi-IP industry

Advanced manufacturing process: The prevalence of smaller nodes enables SoC solutions to thrive and become the mainstream. With the advancement of cutting edge nodes, more IPs within a chip can be accommodated. Based on IBS report, a 28nm node can accommodate 87 IPs, while a 7nm can significantly increase to 178 IPs within a chip. Such transition lowers cost and increases efficiency of a chip and caters for the need of advanced electrical appliances and applications.

Pre-implemented solutions increase success rate in semiconductor design: The semi-IP development mainly comes from the need for tight semiconductor projects.. Semi-IP is a set of reusable designs for chips. Complexity of chip design increases with production of smaller nodes chips. Complexity of semiconductor design increased by 55%, while engineers' design ability did not increase correspondingly at the same pace (only 21%). The IC design is getting more demanding on the cost control and time-to-market of chips. The adoption of reusable semi-IP not only saved time for chip design but also minimized risk for faulty design. It is estimated that every SoC chip consists of ~85-90% reusable design.

China's Domestication of Semiconductor: The US-China tension drove the US to impose more restrictions on China's technological development. Semiconductor was at the center of conflict as China was not able to grow out of reliance from foreign chips. The main driving force of China's semiconductor development comes from government's investment (The National Integrated Circuit Industry Investment Fund). As of 2021, The National Integrated Circuit Industry Investment Fund Phase 1 & 2 amount to RMB ~342 billion.

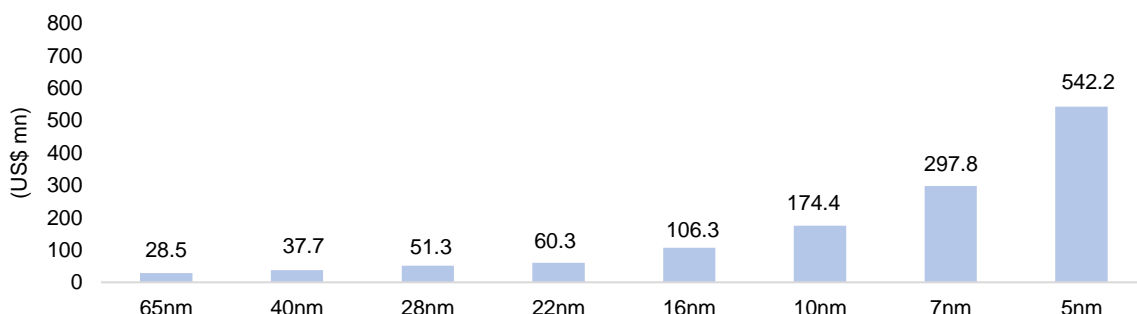
Exhibit 26: Major IC Design Service firms comparison

Company	Faraday (3035 TT)	GUC (3443 TT)	Aichip (3661 TT)	VeriSilicon (688521 CH)
Service Type	IP Service + Design Service + Production	IP Service + Design Service + Production	Design Service (back-end) + Production	IP Service + Design Service + Production
IP Strengths	Analog IP, Interface IP	Analog IP, ASIC	ASIC, SoC, Analog IP	GPU, DSP, VPU, NPU IP
IP Portfolio	Analog IP, Interface IP (Ethernet, USB), I/O, Memory Compiler	HBM2 (High Band Width), T-Cam, Die-To-Die SerDes, Analog IP (Focused on customized functional IP)	Analog IP(PHY, ADC / DAC, PLL / DLL, LDO, BGR, I/O, RTC, POR, etc.)	Processors IP (GPU, NPU, VPU, DSP, ISP), Mixed Digital-Analog IP, Cellular IoT IP
Foundry partners	UMC	TSMC	TSMC (>90% in TSMC), Samsung, SMIC	ASMC, CSMC, Fujitsu, GlobalFoundries, UMC, Hua Hong, Samsung, Silterra, SMIC, Tower Jazz, TSMC, UMC

Source: Company Official Websites, CUIRS

Exhibit 27: Chip Design and Manufacturing Cost under Different Process Nodes (US\$ mn)

(Developing chip under cutting edge process nodes is not easy for small and immature semiconductor market player)



Source: IBS

AIChip | Asia Pacific

Company introduction

Management Profile

Kinying Kwan, 關建英

Kinying Kwan has served as the Chairman of AIChip's Board. Before joining AIChip, Mr. Kwan was also the founder of Altius solutions and worked for Cirrus Logic. He has obtained a bachelor's degree in computer engineering from the University of Illinois, USA.

(Johnny) Shyang-Lin Shen, 沈翔霖

Johnny Shen is the CEO of AIChip and AIChip's GM of China Business Unit and VP of SoC Design Division. Johnny Shen had garnered his experience in Altius solutions. He obtained a Bachelor's Degree in Electrical Engineering at the University of California, Los Angeles, USA.

Daniel Wang, 王德善

Daniel Wang currently takes the position of CFO in AIChip. Before working for AIChip, he worked in multiple semiconductor firms, including Cadence and Altius Solutions. He had worked in the Shanghai Branch of Fubon Securities Investment Services Co., Ltd. before joining AIChip. Daniel obtained an MBA degree in Zicklin School of Business at the CUNY Baruch College, USA.

Junichirou Hosaka, 保坂 純一郎

Junichirou Hosaka-san is the General Manager of the Japan Business Unit of AIChip. He had been the CFO of AIChip and CFO of Inno Micro Corporation and Verisity Design, a software company for electronic systems. Mr. Hosaka obtained a bachelor's degree in Economics at the Yokohama National University, Japan.

Hiroyuki Furuzono, 古園 博幸

Mr. Furuzono served as the Deputy General Manager of Japan Business Unit of AIChip. Before joining AIChip, he is an expert working for multiple electrical systems companies, including Cadence, Simplex, Altius Solutions, and Innotech. Mr. Furuzono obtained a bachelor's degree of Engineering Science at the Waseda University, Japan.

Leo Cheng, 鄭永力

Mr. Cheng is the Vice President of SoC Design Engineering in AIChip. Before working for AIChip, he has taken multiple jobs in Cirrus Logic Inc. and Stream Machine Company. Leo obtained a master's degree of Electrical Engineering at the University of Southern California, USA.

Nancy Chan, 詹舒媚

Nancy serves as the financial controller at AIChip. Before working for AIChip, she worked as the Deputy Manager of Deloitte & Touche. Nancy obtained a master's degree in Risk Management (ISMA) at the University of Reading, UK.

Andy Lin, 林志堅

Andy is the General Manager of the China Business Unit in AIChip. Andy had previously served as the VP of China Business Unit in AIChip. As well as the sales manager of Logitech International S.A. Andy obtained a MBA degree at Said Business School, University of Oxford, UK

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