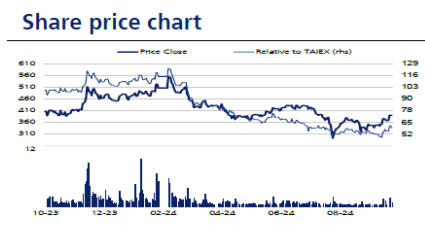


Andes Technology (6533.TW/6533 TT)

2025F profit growth driven by RISC-V

Outperform · Initiated			
Price as of October 7 (NT\$)	390.0		
12M target price (NT\$)	480.0		
Previous target price (NT\$)	N/A		
Unchanged / Revised up (down) (%)	N/A		
Upside (%)	23.1		
Key message			
1. RISC-V penetration is increasing, with China being the region with the highest rate. Andes is expected to benefit from this trend.			
2. Andes' product advantage to support TAM expansion across AI, auto, and IoT sectors.			
3. We believe Andes will turn profitable in 4Q24, with profit growth to accelerate in 2025.			
Trading data			
Mkt cap (NT\$bn/US\$mn)	19.75 / 616		
Outstanding shares (mn)	50.65		
Foreign ownership (mn)	8.72		
3M avg. daily trading (mn)	0.41		
52-week trading range (NT\$)	291.5 -556		
Performance			
	3M	6M	12M
Absolute (%)	-9.6	-9.6	-4.1
Relative (%)	-6	-21.2	-41.5

Quarterly EPS				
NT\$	1Q	2Q	3Q	4Q
2022	2.46A	1.42A	5.77A	(2.62)A
2023	(1.08)A	(0.83)A	2.05A	(2.16)A
2024	(1.00)A	(1.54)A	(0.79)F	1.53F



Source: TEJ

Event

We initiate coverage of Andes Technology with Outperform. We are positive about its future prospects as we expect RISC-V penetration to increase steadily and operating expenses to be controlled well in 2025, leading to profit growth acceleration.

Impact

RISC-V adoption to rise, with Andes set to benefit. Due to its open-source nature, high power efficiency, and ability to be customized, SHD Group forecasts RISC-V penetration in SoC market will rise from 2.7% in 2023 to 22.3% by 2030. China is experiencing the most rapid development among all regions, driven by its pursuit of self-sufficiency and the market's focus on cost efficiency. Andes' technological capabilities are 1-2 years ahead of local competitors, and with the China market contributing 25-30% of its total sales, we believe Andes is well-positioned to benefit from this trend.

Product advantage to support TAM expansion across AI, auto, & IoT sectors. The customizability, flexibility, and power efficiency of RISC-V enables tailored performance optimization for AI, meets the evolving safety demands of EV, and provides optimized solutions for IoT applications. We believe RISC-V will excel in the AI, auto, and IoT markets, with respective 2023-27F IP TAM CAGRs of 102%, 35%, and 31%. With its advanced IP offering certified safety for automotive, specialized tools for AI optimization, and versatile solutions for IoT, Andes is primed to capitalize on opportunities in these markets.

To turn profitable in 4Q24F, with rapid growth in 2025F. Andes significantly expanded R&D in 2023, leading to a rise in expenses, which we believe will peak in 2024. Looking ahead, the firm has no plans to increase hiring, which will allow for better expense control. We believe Andes will turn profitable in 4Q24, with rapid profit growth in 2025, driven by operational efficiency and revenue gains.

Valuation & Action

We forecast sales will grow a respective 22.9% and 37.6% YoY in 2024-25 to NT\$1.30bn and NT\$1.79bn, versus consensus of NT\$1.33bn and NT\$1.80bn. We initiate coverage of Andes with Outperform and a target price of NT\$480, based on 12x 2025F EV/sales, which is in line with its historical average. This multiple also aligns with the 12x historical average of its industry peers, roughly 50% of the 24x average since the ARM (UK) IPO.

Risks

Weak macroeconomic environment; fierce pricing competition.

Key financials and valuations

	Dec-21A	Dec-22A	Dec-23A	Dec-24F	Dec-25F
Revenue (NT\$mn)	820	932	1,058	1,300	1,789
Gross profit (NT\$mn)	818	931	1,057	1,299	1,788
Operating profit (NT\$mn)	159	(69)	(268)	(377)	79
Net profit (NT\$mn)	162	356	(102)	(91)	201
EPS (NT\$)	3.59	7.03	(2.01)	(1.80)	3.97
Cash DPS (NT\$)	2.85	1.50	-	-	0.79
EPS growth (%)	335.4	95.9	(128.6)	(10.5)	0.0
PE (x)	108.7	55.5	N.A.	N.A.	98.1
PB (x)	4.1	4.0	4.1	4.2	4.0
EV/EBITDA (x)	45.7	124.3	4,573.5	171.2	27.9
Net debt to equity (%)	Net cash	Net cash	Net cash	Net cash	Net cash
Dividend yield (%)	0.7	0.4	0.0	0.0	0.2
Return on average equity (%)	5.4	7.3	(2.1)	(1.9)	4.2

Source: Company data, KGI Research estimates

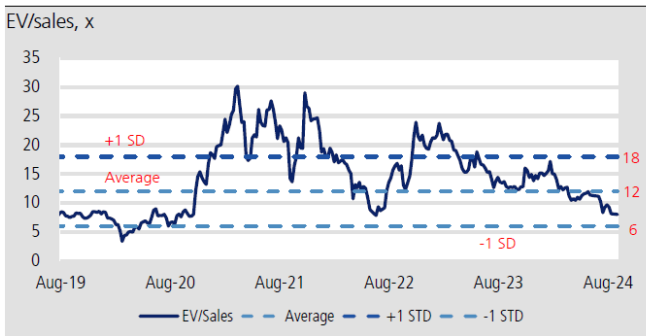
Valuation

We initiate coverage of Andes with Outperform and a target price of NT\$480, based on 12x 2025F EV/sales, implying 23.1% upside.

Andes growth backed by multiple drivers, with attractive valuation

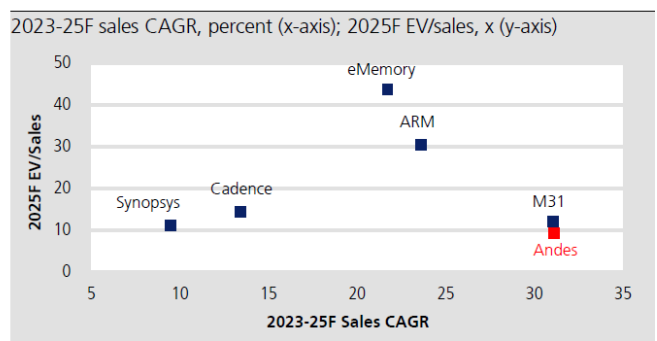
We initiate coverage of Andes with Outperform and a target price of NT\$480, based on 12x 2025F EV/sales, implying 23.1% upside. We are optimistic about Andes' long-term operational outlook due to: (1) SHD Group forecasts penetration of RISC-V in SoC market will rise from 2.7% in 2023 to 22.3% by 2030; (2) China has the highest RISC-V penetration, and it has experienced rapid growth in recent years. China contributes approximately 25-30% of Andes' revenue, and the firm's technological capabilities are ahead of local competitors by 1-2 years; (3) with the open-source nature and high level of customization of RISC-V, we believe adoption will rise in the AI, automotive, and IoT sectors, for respective projected IP TAM CAGRs of 102%, 35%, and 31% in 2023-27; and (4) opex growth will taper off by 2025F, and operating leverage will emerge. We believe these factors will help the company turn profitable in 4Q24, with accelerated profit growth in 2025. We value Andes based on EV/sales, assigning a multiple of 12x, which is in line with its historical average, resulting in a target price of NT\$480. This multiple also aligns with the 12x historical average of its industry peers, roughly 50% of the 24x average since the ARM (UK) IPO.

Figure 1: With multiple growth drivers, we believe Andes' valuation is attractive based on its historical range



Source: Bloomberg; KGI Research

Figure 2: Global IP players – EV/sales vs. sales growth



Source: KGI Research estimates

Figure 3: Peer comparison – Valuations

Company	Code	Market cap (US\$ mn)	Share price (LCY)	Sales (LCY)		Sales CAGR (%) (2023-2025F)	EPS (LCY)		PBR (x)		EV/Sales (x)	
				2024F	2025F		2024F	2025F	2024F	2025F	2024F	2025F
Andes	6533 TT	612	390.0	1,300	1,789	30.0	(1.80)	3.97	4.1	3.9	13.3	9.7
M31	6643 TT	1,078	832.0	1,924	2,770	31.1	12.37	21.85	12.7	10.4	17.7	12.3
eMemory	3529 TT	6,941	3,000.0	3,742	4,655	23.5	26.18	33.16	61.1	51.3	58.9	47.3
AP Memory	6531 TT	1,538	306.0	4,244	5,572	14.8	9.71	11.71	2.8	2.6	9.3	7.1
YMC	6423 TT	84	91.6	266	336	33.9	1.19	2.11	N.M.	N.M.	8.4	6.6
ARM	ARM US	147,296	140.6	3,233	3,973	10.9	1.20	1.57	28.5	23.1	44.9	36.5
Synopsys	SNPS US	76,672	499.1	6,175	6,903	8.7	13.13	14.95	9.5	7.9	12.2	10.9
Cadence	CDNS US	73,562	268.7	4,625	5,260	13.4	5.88	6.91	15.4	12.2	16.0	14.0
ALPHAWAVE IP	AWE LN	1,018	104.8	318	443	17.3	0.04	0.08	163.8	145.6	2.8	2.0
Peer Average									12.2	10.0	12.8	10.1

Source: Bloomberg; KGI Research estimates

Financial analysis & business outlook

As the penetration of RISC-V continues to increase and Andes has competitive advantages, we estimate the firm will turn profitable in 4Q24, for respective 2024-25 EPS of NT\$-1.80 and NT\$3.97.

Operating leverage to emerge in 2025F

As the penetration of RISC-V continues to increase and Andes has competitive advantages, we forecast its revenue will grow a respective 22.9% and 37.6% YoY in 2024-25. Without any large-scale recruitment plans, we believe expense growth will significantly taper off in 2025, allowing operating leverage to emerge. Therefore, we estimate the company will turn profitable in 4Q24, for respective 2024-25 EPS of NT\$-1.80 and NT\$3.97.

Licensing fees account for about 80% of Andes' revenue, while royalty fees make up the remaining 20%. Approximately 90% of licensing fees come from RISC-V, which has an ASP more than double that of V3 architecture. We believe as the number of RISC-V contracts grows on increasing penetration, and prices rise with the introduction of high-end products, licensing fee sales will grow over 30% YoY in both 2024 and 2025. As for royalties, 90% come from V3, providing stable cash flow. We believe RISC-V-related core IP previously licensed by the firm will gradually enter mass production, and the company's high-end products, which produced via advanced processes, will experience both price and volume growth, similar to licensing fees. We estimate royalty fees will grow a respective 23% and 33% YoY in 2024-25F.

Figure 4: Breakdown of 2Q24 results & 3Q24 forecasts versus consensus

NT\$m	2Q24			3Q24F				
	Actual	QoQ (%)	YoY (%)	KGI forecast	QoQ (%)	YoY (%)	Consensus	Diff. (%)
Sales	278	30.6	55.4	332	19.3	34.2	337	(1.4)
Gross profits	279	30.9	56.4	332	19.1	34.3	336	(1.3)
Operating income	(147)	-	-	(91)	-	-	(75)	-
Net income	(78)	-	-	(40)	-	-	(9)	-
EPS (NT\$)	(1.54)	-	-	(0.79)	-	-	(0.18)	-
Gross margin (%)	100.1	0.2 ppts	0.6 ppts	99.9	(0.2)ppts	0.1 ppts	99.8	0.1 ppts
OP margin (%)	(52.7)	38.5 ppts	26.1 ppts	(27.4)	25.3 ppts	(0.2)ppts	(22.2)	(5.2)ppts
Net margin (%)	(28.0)	(4.1)ppts	(4.5)ppts	(12.1)	15.9 ppts	(54.1)ppts	(2.7)	(9.3)ppts

Source: Company data; KGI Research estimates

Figure 5: Breakdown of 2023 results & 2024-25 forecasts versus consensus

NT\$m	2023		2024F				2025F			
	Actual	YoY (%)	KGI forecast	YoY (%)	Consensus	Diff. (%)	KGI forecast	YoY (%)	Consensus	Diff. (%)
Sales	1,058	13.5	1,300	22.9	1,327	(2.0)	1,789	37.6	1,806	(0.9)
Gross profit	1,057	13.5	1,299	22.9	1,325	(2.0)	1,788	37.6	1,803	(0.8)
Operating income	(268)	-	(377)	-	(299)	-	79	-	171	(53.7)
Net income	(102)	-	(91)	-	(25)	-	201	-	310	(35.0)
EPS (NT\$)	(2.01)	-	(1.80)	-	(0.50)	-	3.97	-	6.12	(35.0)
Gross margin (%)	99.9	0.0 ppts	99.9	0.0 ppts	99.9	0.1 ppts	99.9	(0.0)ppts	99.8	0.1 ppts
OP margin (%)	(25.4)	(18.0)ppts	(29.0)	(3.6)ppts	(22.5)	(6.5)ppts	4.4	33.4 ppts	9.5	(5.0)ppts
Net margin (%)	(9.6)	(47.8)ppts	(7.0)	2.6 ppts	(1.9)	(5.1)ppts	11.3	18.3 ppts	17.2	(5.9)ppts

Source: Company data; KGI Research estimates

Investment thesis

Penetration of RISC-V in the SoC market to rise from 2.7% in 2023F to 22.3% by 2030F, reaching a value of US\$92.7bn.

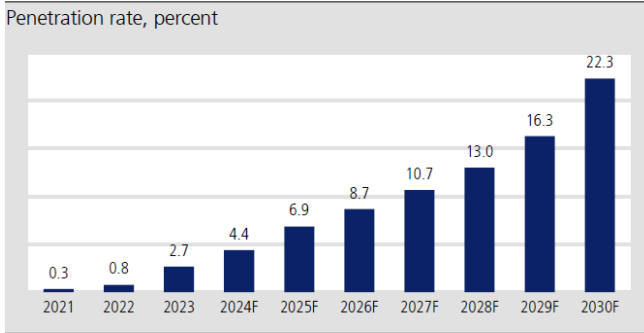
RISC-V penetration is growing on its open-source nature, high power efficiency, & customizability

The computing world is dominated by two major processor architectures – x86 and ARM. Each has carved a unique path through the technological landscape, establishing distinct presences in various sectors. RISC-V is a relatively new player in the field of processor architectures, yet it has garnered significant attention.

Key features of RISC-V include: (1) open-source – One of RISC-V's most distinguishing features is its open-source nature. This democratizes processor design, allowing companies, academic institutions, and individual developers to contribute to and leverage the architecture. This collaborative environment accelerates innovation and reduces costs, making RISC-V particularly attractive for start-ups and research projects; (2) modularity and extensibility – RISC-V's modular design is another key trait. The base integer instruction set can be supplemented with optional extensions for specific applications, such as floating-point operations, vector processing, and atomic operations. This extensibility allows for the creation of highly customized processors that are optimized for particular tasks, without the overhead of unnecessary features; and (3) simplicity and efficiency – The reduced instruction set computing (RISC) philosophy underpinning RISC-V emphasizes simplicity and efficiency. With fewer instructions, RISC-V processors can be smaller, consume less power, and have a lower cost than complex instruction set computing (CISC). This makes RISC-V an excellent choice for embedded systems, where power efficiency and cost are critical.

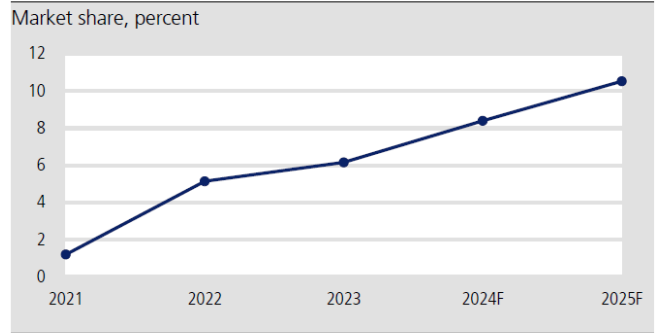
RISC-V's advantages make it particularly suitable for applications where customization and efficiency are paramount, particularly in the SoC market. According to third-party research firm SHD Group, penetration of RISC-V architecture in the SoC market will increase from 2.7% in 2023 to 22.3% by 2030, reaching a value of US\$92.7bn. One of the primary reasons for RISC-V's success in the SoC market is its highly customizable nature. Developers can tailor the architecture to meet the specific needs of their applications, whether it's for IoT devices, auto electronics, or industrial control systems. This level of customization is invaluable in the SoC market, where differentiation and specific functionality can be crucial competitive advantages. Also, being an open standard, RISC-V eliminates the need for expensive licensing fees associated with proprietary ISAs. This cost advantage is particularly appealing for companies looking to develop SoCs, as it allows them to allocate more resources to other areas of development and innovation. Furthermore, RISC-V's simplicity and efficiency resonate well with the demands of the SoC market, where power consumption is a critical factor. Its efficient use of instructions can lead to lower power consumption, making it an ideal choice for power-sensitive applications. In the AI domain, for example, the ability to add custom instructions or accelerators can significantly improve the performance of machine learning algorithms. Similarly, in the embedded and IoT sectors, RISC-V's low power consumption and reduced complexity make it an attractive option for devices with limited resources.

Figure 6: Penetration of RISC-V in SoC market is increasing



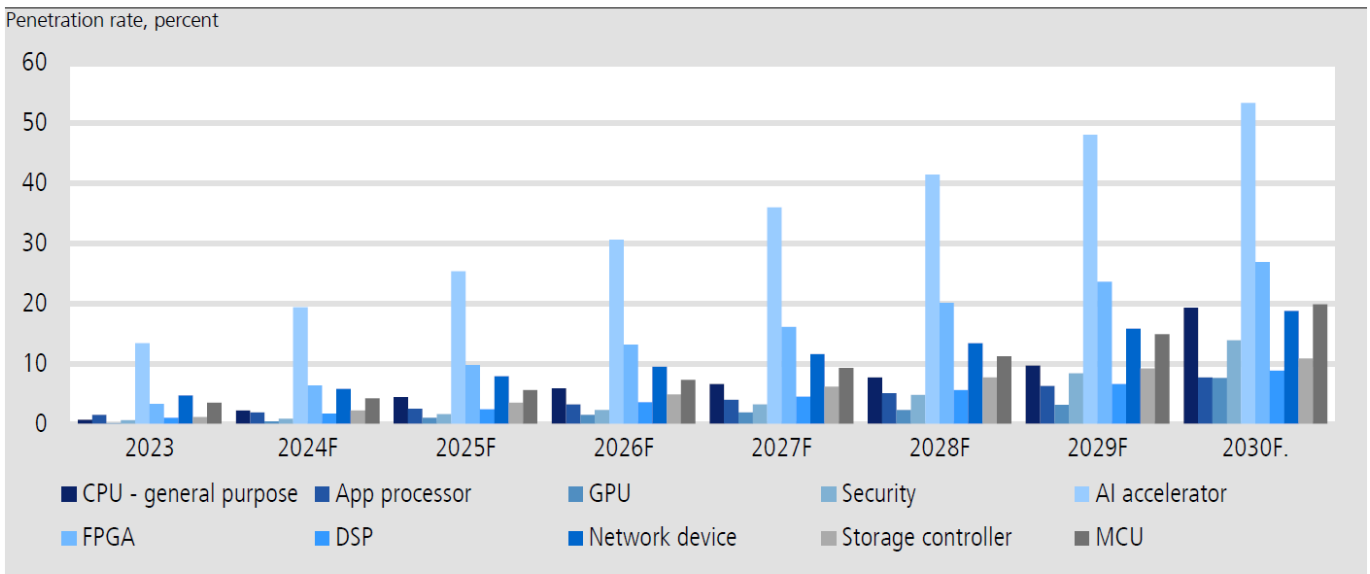
Source: SHD Group; KGI Research estimates

Figure 7: Andes' market share in RISC-V is increasing



Source: KGI Research estimates

Figure 8: AI accelerators will see the highest RISC-V penetration



Source: SHD Group; KGI Research estimates

Figure 9: Comparison between three main ISAs

Feature	RISC-V	x86	ARM
Instruction set	RISC	CISC	RISC
Power efficiency	Highly power-efficient	Generally less power-efficient	Highly power-efficient
Performance	Scalable performance, designed to be efficient	High performance for general-purpose computing	Optimized for energy efficiency, can offer competitive performance
Usage	Increasingly used in embedded systems, IoT, and research	Primarily used in desktop, laptop, and server CPUs	Widely used in mobile devices, embedded systems
License model	Open-source, free to use and modify	Proprietary, controlled by Intel and AMD	Licensed by ARM Holdings
Customizability	Highly customizable by design	Limited customizability	Limited customizability
Ecosystem	Growing ecosystem with increasing support	Mature with extensive software support	Well-established, esp. in mobile devices
Instruction set size	Modular and extendable	Large and complex	Small and optimized
Backward compatibility	Depends on the extensions implemented	Strong backward compatibility, support legacy applications	Generally good backward compatibility
Development cost	Lower	High	Moderate

Source: KGI Research

China accounts for 27% of the global RISC-V market, providing Andes with an opportunity to generate substantial revenue.

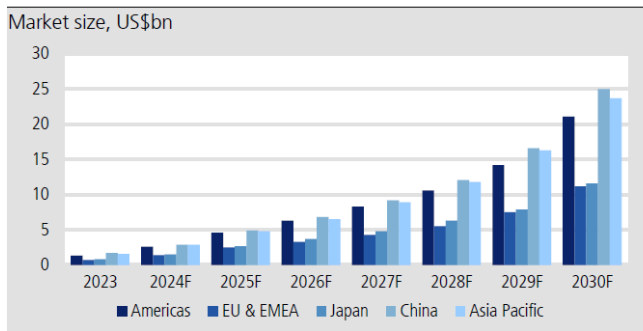
China has become a stronghold for RISC-V due to its goal of technological self-sufficiency and cost considerations

China is rapidly becoming the largest market for RISC-V due to a combination of strategic, economic, and technological factors. For Andes, which derives about 25-30% of its revenue from China, this presents a significant growth opportunity. The following are the key reasons behind China's leading position in RISC-V adoption.

- 1. Technological autonomy and self-sufficiency.** China aims to achieve technological independence, especially amid geopolitical tensions and the risk of technological embargoes from the US. RISC-V, being an open-source architecture free from proprietary controls, provides China with the flexibility to innovate without reliance on foreign technologies like ARM or x86 architectures. This aligns well with China's strategy to minimize its dependency on Western tech giants.
- 2. Government support and policy initiatives.** The China government's robust backing of the semiconductor and broader tech sectors, through substantial investments and favorable policies, creates a conducive environment for RISC-V growth. State support accelerates research, development, and commercialization of RISC-V-based technologies.
- 3. Cost considerations.** One of the major advantages of RISC-V is its cost-effectiveness. Unlike ARM or x86 architectures that require expensive licensing fees, RISC-V is open-source and free to use, reducing the cost barrier for companies and encouraging innovation. This cost advantage is particularly appealing in China, where companies, both start-ups and established firms alike, are eager to minimize expenses while maximizing innovation.
- 4. Ecosystem and market demand.** The sheer size of China's market, combined with its manufacturing prowess, provides a massive platform for RISC-V adoption. The scale at which China can implement RISC-V in its domestic products could significantly drive the growth of RISC-V.

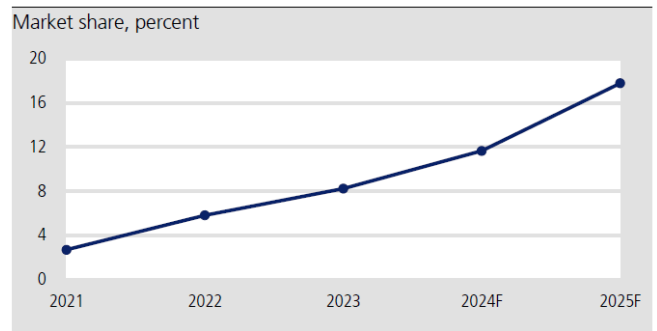
According to SHD Group, the size of China's RISC-V industry will grow at a 2023-30F CAGR of 47% and reach US\$25bn by 2030, accounting for 27% of the global RISC-V market, making it the largest in the world. For Andes, the expansion of the RISC-V market in China offers significant growth potential, particularly for high-end products, which come with licensing fees that are several times higher than those for low-end products, providing Andes with an opportunity to generate substantial revenue. Despite the intense competition in the low to midrange segments, where many local companies are aggressively competing on price, Andes maintains a technological advantage of 1-2 years over Chinese competitors. This edge is crucial in the high-end market, where demand for performance and customization is growing.

Figure 10: China is the largest market for RISC-V



Source: SHD Group; KGI Research estimates

Figure 11: Andes' RISC-V market share in China is increasing



Source: KGI Research estimates

AI, auto, and IoT are key sectors for RISC-V to grow, and Andes will benefit from its product advantages and successful partnerships with well-known companies.

Andes to benefit from RISC-V growth in AI, auto, & IoT sectors

AI

The GPU market is currently dominated by Nvidia (US), a powerhouse with a highly mature ecosystem supported by its Compute Unified Device Architecture (CUDA) platform, which is a parallel computing platform and application programming interface (API) model that allows developers to use a CUDA-enabled GPU for general purpose processing. NVIDIA's GPUs are widely used in fields ranging from video gaming and graphics rendering to scientific computing and deep learning, underscoring the versatility and power of their architecture.

We believe that RISC-V has limited opportunities in the GPU market, primarily due to: (1) established ecosystem – NVIDIA's ecosystem, including extensive developer tools, libraries, and a community of developers, forms a significant entry barrier for new architectures like RISC-V. Transitioning to a new ISA within such an entrenched ecosystem involves substantial challenges, from software compatibility and performance optimization to developer adoption and support; and (2) high performance expectations – GPUs require extremely high throughput for tasks like rendering graphics and processing complex computations in AI and machine learning. NVIDIA's architectures are specifically optimized for these tasks, leveraging years of research and development to maximize efficiency and performance.

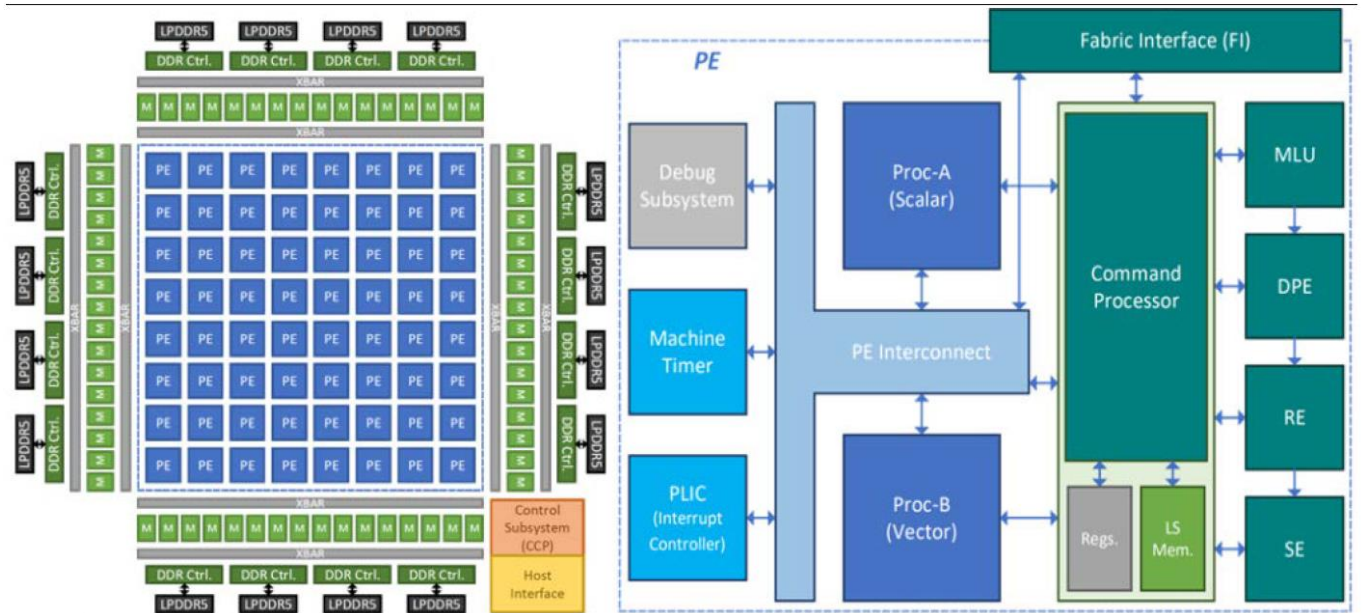
Conversely, AI ASIC – processors specifically designed to handle AI tasks – present fertile ground for RISC-V to grow. These chips often need to balance power efficiency with the ability to perform a large number of parallel operations, a requirement that is well-aligned with the modular and flexible design of RISC-V. Below are the reasons why RISC-V fits well with AI ASICs: (1) customization needs – AI ASIC often requires specific optimizations to enhance performance for particular AI models or algorithms. RISC-V's open-source nature allows for significant modifications and custom instruction sets, enabling chip designers to tailor the architecture directly to their needs without the constraints of proprietary ISA limitation; (2) rapid innovation – The field of AI is characterized by rapid innovation and frequent shifts in algorithmic approaches and model architectures. RISC-V's flexibility and adaptability make it an excellent match for an environment where a processor might need to evolve quickly to accommodate new types of neural networks or AI applications; (3) cost and scalability – Without licensing fees, RISC-V can offer a cost-effective solution for start-ups and smaller companies looking to develop custom AI chips. Furthermore, the scalability of RISC-V from small to high-performance cores allows it to cover a wide range of AI applications, from edge devices to data centers; and (4) security features – AI applications often process sensitive data, making security a critical concern. RISC-V enables the integration of custom security features directly into the chip's ISA, enhancing data protection capabilities at the hardware level.

Andes offers several unique features that make its RISC-V IP cores particularly well-suited for AI ASIC applications. Customizable vector extensions allow for the acceleration of machine learning workloads by enabling efficient parallel processing, which is especially useful for handling large matrices and tensors in neural network training and inference. The cores also optimize memory access patterns, reducing latency and increasing throughput, which is critical for data-intensive AI tasks. Moreover, Andes has developed tools and libraries that integrate their RISC-V cores with popular AI frameworks, simplifying the implementation of AI algorithms and their optimization for specific hardware configurations.

One of the examples is Meta's (US) MTIA, which uses Andes' RISC-V IP cores primarily due to the vector cores and extensive customization options that Andes provides. In MTIA's processing elements, these IP cores were heavily customized to meet specific functional requirements. Customization includes tailored interfaces, registers, instructions, and exception handling. For instance, custom interfaces allow the processor cores to

connect with Meta’s accelerators, enabling the transmission of commands to fixed function units and facilitating data movement between them. Additionally, custom instructions were added to trigger specific operations within the fixed function units, allowing for optimized performance. This flexibility in customization was crucial for Meta, as it enabled the MTIA to handle specific tasks more efficiently by leveraging Andes’ ability to deeply tailor the IP cores to their precise needs.

Figure 12: Meta’s MTIA utilizes Andes’ IP cores



Source: Company data

We estimate that the CAGR for RISC-V architecture processor IP in the AI ASIC field will reach 102% in 2023-27, representing the highest growth among all applications. This estimate is based on the following assumptions:

- The assumption for AI server shipments in 2024-25 is based on CoWoS capacity projections, with an estimated annual growth of 15-20% in AI server shipments for 2026-27.
- ASIC penetration is expected to gradually increase from 24% in 2023 to 30% in 2027.
- ASIC ASP ranges from thousands to tens of thousands of US dollars. We assume an average value and expect an annual increase of about 5-10% YoY due to higher specification requirements.
- Generally, ASIC per server ranges from two to eight; we conservatively assume an average of four.
- The global semiconductor IP market represents 1-2% of the global semiconductor market, so we assume ASIC IP TAM to be 1% of the ASIC semiconductor value.
- According to estimates from SHD Group, the penetration of RISC-V in ASIC will increase from 13.4% in 2023 to 36% in 2027.

Figure 13: We estimate the CAGR for RISC-V architecture processor IP in AI ASIC will reach 102% in 2023-27

	2023	2024F	2025F	2026F	2027F
AI server shipment (k units)	578	696	1,609	1,850	2,128
ASIC penetration rate	24	25	26	28	30
ASIC ASP (US\$)	9,000	9,720	10,498	11,337	12,244
Number of ASIC per server	4	4	4	4	4
ASIC semi value (US\$mn)	5,015	6,846	17,701	23,496	31,266
IP TAM	50.1	68.5	177.0	235.0	312.7
RISC-V penetration rate	13.4	19.4	25.4	30.6	36.0
RISC-V TAM	6.7	13.3	45.0	71.9	112.6

Source: SHD Group; KGI Research estimates

Automotive

The auto industry is currently experiencing a significant technological transformation, largely driven by the increasing integration of advanced electronics into vehicles. This shift is contributing to the robust growth of the automotive semiconductor sector. According to Gartner, automotive processors will grow at a CAGR of 10% in 2023-27. Several factors contribute to this vigorous expansion, including the rise of electric vehicles (EVs), autonomous driving technologies, and the need for enhanced safety and connectivity features.

RISC-V is also poised to make substantial inroads in this burgeoning market. From modest penetration of 5% in 2023, we expect RISC-V to surge to 13% penetration by 2027. This growth trajectory suggests that TAM for RISC-V IP in auto applications will skyrocket at a 2023-27 CAGR of 35%, reaching approximately US\$56mn by the end of the period.

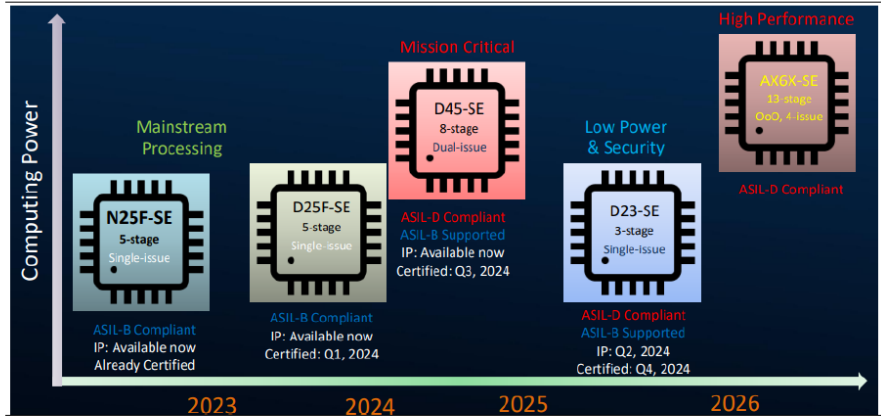
Figure 14: We forecast TAM for RISC-V IP in auto applications will skyrocket at 2023-27 CAGR of 35%

US\$mn	2023	2024F	2025F	2026F	2027F
Auto processor revenue	30,203	32,863	37,885	41,091	43,764
IP TAM	302	329	379	411	438
RISC-V penetration rate (%)	5.6	7.5	8.7	10.3	12.8
RISC-V TAM	17.0	24.5	32.9	42.5	55.9

Source: Gartner; SHD Group; KGI Research estimates

Andes has invested heavily in R&D tailored to auto applications. The firm was the first RISC-V IP vendor to achieve ISO 26262 certification, which is pivotal for meeting stringent auto safety standards. Their N25F-SE processor is a testament to this focus, as it offers robust fault tolerance and safety features, designed specifically to cater to the rigorous demands of auto safety-critical systems. Looking ahead, Andes is set to expand its product line with the introduction of the D25F-SE and D45-SE in 2024. The D25F-SE can be utilized in more complex ADAS, like lane keeping assist and adaptive cruise control, which need to process data from multiple sensors in real-time to make immediate decisions. The D45-SE targets higher-level autonomous applications, and is capable of processing large volumes of data from cameras, radars, and LIDAR – essential for achieving full autonomous driving. Furthermore, Andes is committed to the continuous development of its auto product portfolio, with plans to introduce high-performance 60-series products, which are expected to offer unprecedented performance, catering to the future needs of an increasingly sophisticated auto semiconductor market.

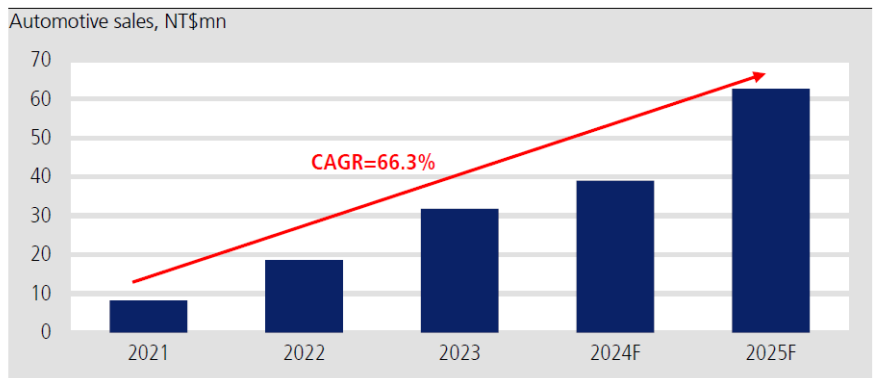
Figure 15: Andes continues to launch advanced products for auto applications



Source: Company data

However, it is important to note that due to safety concerns, auto applications often require extended certification periods. We believe that there could be a 4-5 year gap between receiving licensing fees and collecting royalty fees for products in the auto sector. This delay is primarily due to the rigorous testing and certification processes needed to ensure that auto components meet the highest safety standards before they are deployed. Furthermore, the client base of Andes in the auto sector predominantly consists of small- to medium-sized start-ups in China. The journey from product development to mass production is fraught with challenges, including scaling up manufacturing and navigating complex regulatory landscapes. Consequently, the probability of these start-ups successfully reaching mass production may be relatively lower compared to larger, more established companies. We still believe that Andes will continue to launch high-spec auto products, driving the growth of licensing fees. However, we remain cautious regarding the payment of royalty fees.

Figure 16: Continuous launch of advanced auto products will result in Andes' auto application sales CAGR of 64% in 2021-25F



Source: Company data, KGI Research estimates

IoT

RISC-V allows for significant customization, which is a crucial advantage in the IoT market, where applications can vary greatly in terms of complexity and power consumption. This flexibility enables designers to tailor the architecture to their specific needs, reducing unnecessary overhead and enhancing performance. Furthermore, the simplicity of RISC-V, characterized by a clean, modular approach in its instruction set, facilitates easier hardware implementation and reduces power consumption.

Several well-known companies have already adopted RISC-V for their IoT products. For example, Alibaba's (CN) T-Head division has developed a series of processors based on RISC-V, tailored for IoT applications, reflecting the architecture's growing traction in China. Similarly, Renesas (JP), a leading microcontroller and semiconductor company, has integrated RISC-V cores into its microprocessors, which are used in various IoT applications, highlighting the flexibility and performance benefits of the architecture.

Despite RISC-V advantages, the IoT market is currently dominated by ARM. ARM's stronghold in the IoT sector can be attributed to its well-established ecosystem, comprehensive software support, and a wide range of IP cores optimized for IoT applications. ARM's Cortex-M series, for instance, is widely used in microcontrollers that power a vast array of IoT devices, from consumer electronics to industrial sensors. The familiarity and reliability of ARM's architecture, along with extensive developer resources and robust security features, have made it the default choice for many IoT projects.

Looking forward, RISC-V has the potential to gain a more substantial foothold in the IoT market. Its open-source nature and growing ecosystem make it an increasingly viable alternative to ARM, particularly as more companies and developers seek to avoid licensing fees and proprietary constraints. In markets like China, where there is a strong push for technological self-sufficiency and a preference for open standards, RISC-V is likely to see faster adoption. China's emphasis on building a robust domestic semiconductor industry aligns well with the principles of RISC-V, offering more opportunities for local companies to innovate and compete without the overhead costs associated with ARM's licensing model.

Based on Gartner's projected IoT processor revenue, we estimate TAM for RISC-V IP in the IoT market will deliver a CAGR of 31% in 2023-27.

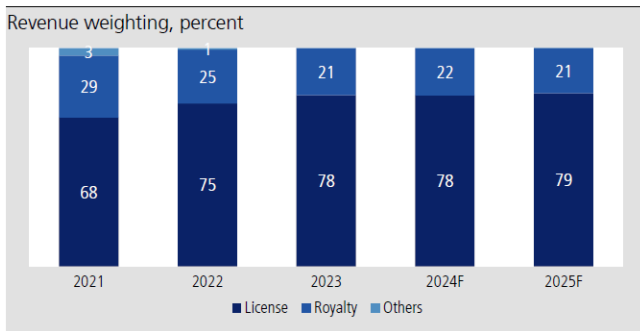
Figure 17: We estimate TAM for RISC-V IP in IoT market will deliver CAGR of 31% in 2023-27

US\$m	2023	2024F	2025F	2026F	2027F
IoT Processor Revenue	47,261	52,888	59,688	66,176	74,285
IP TAM	473	529	597	662	743
RISC-V penetration (%)	8.0	10.0	12.0	13.5	15.0
RISC-V TAM	3,781	5,289	7,163	8,934	11,143

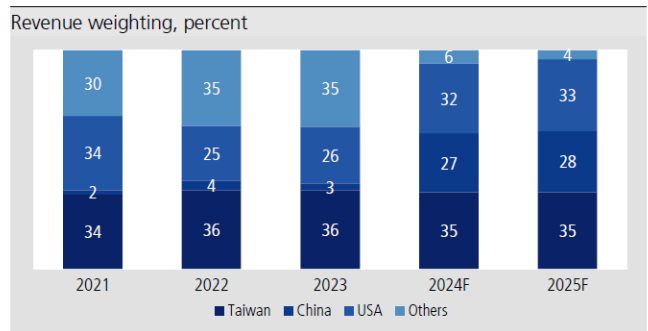
Source: Gartner; SHD Group; KGI research estimates

Company profile

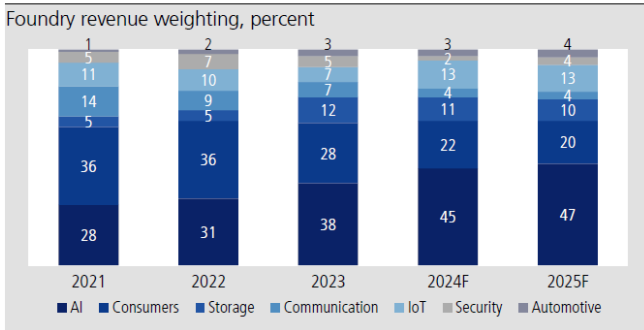
Founded in 2015, Andes Technology is a well-established high-tech company. Andes' core mission is to provide innovative performance-efficient processor solutions for low-power SoC. Andes provides various series of CPU IP based on RISC-V. In 2023, revenue mix was 78% from licensing fees and 22% from royalty fees. By application, 38% of revenue came from AI, 28% from consumers, 12% from storage, 7% from communication, 7% from IoT, 5% from security, and 3% from auto. Clients include Meta, Renesas, MediaTek (2454 TT, NT\$1,250, N), and others. Geographically, the company's largest market is Taiwan (36% in 2023), followed by the US (31% in 2023), and China (26% in 2023).

Figure 18: Andes revenue mainly comes from licensing fees


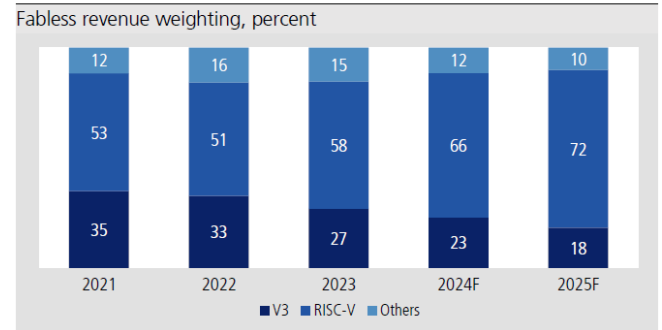
Source: Company data; KGI Research estimates

Figure 19: The company's largest market is Taiwan, followed by the US & China


Source: Company data; KGI Research estimates

Figure 20: Revenue contribution from AI, auto, & IoT keeps increasing


Source: Company data; KGI Research estimates

Figure 21: Revenue weighting of RISC-V keeps increasing


Source: Company data; KGI Research estimates

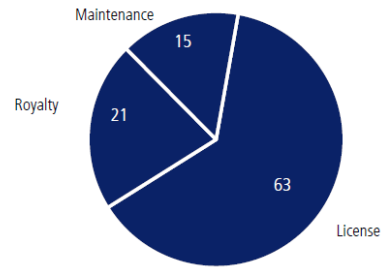
Figure 22: Company profile

Founded in 2015, Andes Technology is a well-established high-tech company. Andes' core mission is to provide innovative performance-efficient processor solutions for low-power SoC. The firm provides various series of CPU IP based on RISC-V. In 2023, revenue mix was 78% from licensing fees and 22% from royalty fees. Clients include Meta (US), Renesas (JP), MediaTek (2454 TT, NT\$1,250, N), and others.

Source: KGI Research

Figure 23: 2023 revenue by application

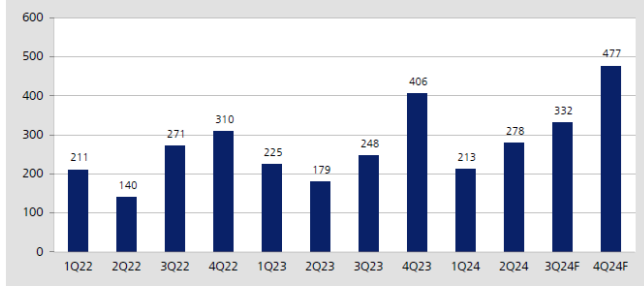
Revenue weighting, percent



Source: Company data

Figure 24: Sales

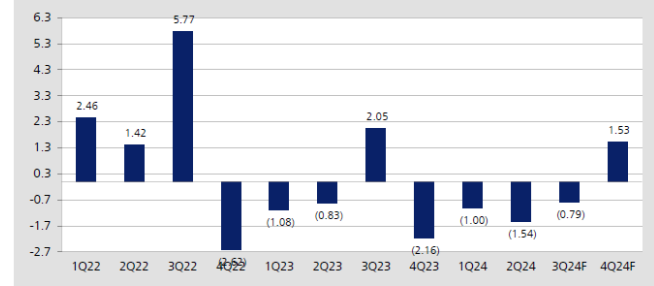
Sales, NT\$m



Source: KGI Research

Figure 25: EPS

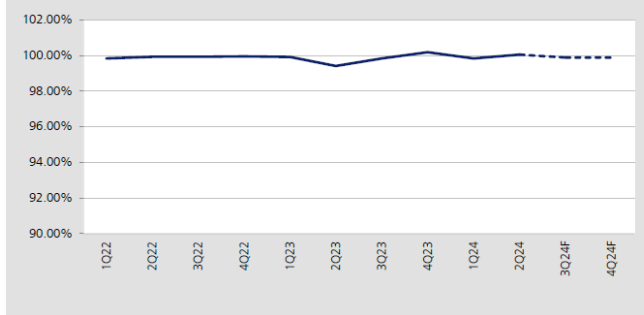
EPS, NT\$



Source: KGI Research

Figure 26: Gross Margin

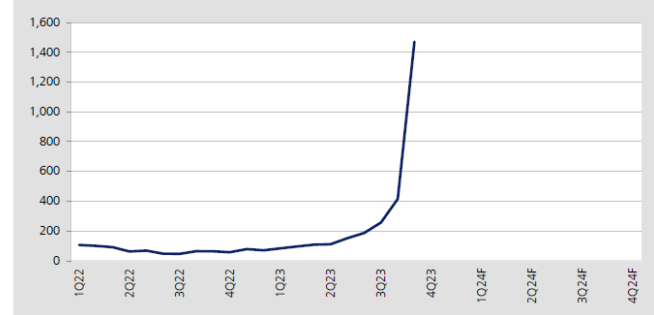
Gross margin, percent



Source: KGI Research

Figure 27: Rolling PE

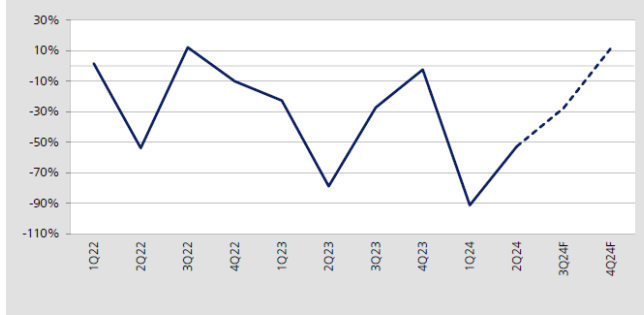
Rolling PE, times



Source: KGI Research

Figure 28: Operating Margin

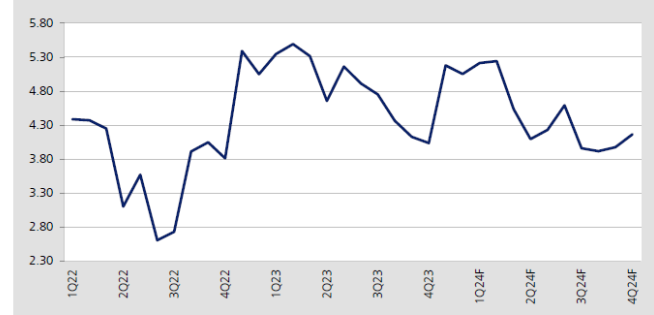
Operating margin, percent



Source: KGI Research

Figure 29: Rolling PB

Rolling PB, times



Source: KGI Research

Income statement

	Quarterly								Annually		
	Mar-23A	Jun-23A	Sep-23A	Dec-23A	Mar-24A	Jun-24A	Sep-24F	Dec-24F	Dec-23A	Dec-24F	Dec-25F
Income statement (NT\$m)											
Revenue	225	179	248	406	213	278	332	477	1,058	1,300	1,789
Cost of goods sold	(0)	(1)	(0)	1	(0)	0	(0)	(1)	(1)	(1)	(2)
Gross profit	225	178	247	407	213	279	332	476	1,057	1,299	1,788
Operating expenses	(276)	(319)	(314)	(416)	(407)	(425)	(423)	(421)	(1,325)	(1,676)	(1,708)
Operating profit	(51)	(141)	(67)	(9)	(194)	(147)	(91)	55	(268)	(377)	79
Depreciation of fixed assets	(10)	(11)	(14)	(16)	(17)	(17)	(17)	(19)	(51)	(69)	(91)
Amortisation of intangible assets	(52)	(52)	(51)	(66)	(93)	(100)	(102)	(114)	(221)	(408)	(442)
EBITDA	12	(78)	(2)	72	(85)	(30)	28	187	4	101	612
Interest income	24	28	66	35	32	29	26	28	154	116	114
Investment income	-	-	-	-	-	-	-	-	-	-	-
Other non-op income	2	2	3	3	6	4	-	-	10	9	-
Non-operating income	26	31	69	38	38	33	26	28	163	125	114
Interest expense	(0)	(0)	(1)	(1)	(1)	(1)	(0)	(0)	(2)	(2)	(2)
Investment loss	-	-	-	-	-	-	-	-	-	-	-
Other non-op expenses	(31)	73	112	(146)	112	34	15	15	8	176	60
Non-operating expenses	(31)	72	111	(147)	111	33	15	15	6	173	58
Pre-tax profit	(56)	(38)	113	(118)	(45)	(80)	(50)	97	(99)	(79)	252
Current taxation	1	(4)	(9)	9	(6)	2	10	(19)	(3)	(12)	(50)
Minorities	-	-	-	-	-	-	-	-	-	-	-
Normalised net profit	(55)	(42)	104	(109)	(51)	(78)	(40)	78	(102)	(91)	201
Extraordinary items	0	0	0	0	(0)	0	-	-	-	0	-
Net profit	(55)	(42)	104	(109)	(51)	(78)	(40)	78	(102)	(91)	201
EPS (NT\$)	(1.08)	(0.83)	2.05	(2.16)	(1.00)	(1.54)	(0.79)	1.53	(2.01)	(1.80)	3.97
Margins (%)											
Gross profit margin	99.9	99.4	99.8	100.2	99.8	100.1	99.9	99.9	99.9	99.9	99.9
Operating margin	(22.6)	(78.8)	(27.2)	(2.3)	(91.1)	(52.7)	(27.4)	11.5	(25.4)	(29.0)	4.4
EBITDA margin	5.2	(43.7)	(0.8)	17.8	(39.8)	(10.8)	8.6	39.3	0.4	7.8	34.2
Pretax profit margin	(24.7)	(21.3)	45.6	(29.1)	(21.2)	(28.8)	(15.1)	20.4	(9.4)	(6.0)	14.1
Net profit margin	(24.2)	(23.4)	42.0	(26.9)	(23.8)	(28.0)	(12.1)	16.3	(9.6)	(7.0)	11.3
Sequential growth (%)											
Revenue growth	(27.3)	(20.4)	38.2	64.0	(47.5)	30.6	19.3	43.4			
Gross profit growth	(27.3)	(20.8)	38.8	64.6	(47.7)	30.9	19.1	43.4			
Operating profit growth	64.7	177.5	(52.4)	(86.2)	1986.5	(24.5)	(37.9)				
EBITDA growth	(46.3)	(763.8)	(97.6)		(217.3)	(64.4)		558.5			
Pretax profit growth	(55.2)	(31.5)		(204.8)	(61.8)	77.5	(37.7)				
Net profit growth	(59.0)	(22.9)		(205.0)	(53.5)	53.2	(48.5)				
YoY growth (%)											
Revenue growth	6.7	27.8	(8.7)	31.2	(5.3)	55.4	34.2	17.4	13.5	22.9	37.6
Gross profit growth	6.8	27.2	(8.8)	31.5	(5.4)	56.4	34.3	17.0	13.5	22.9	37.6
Operating profit growth	(1485.5)	87.6	(302.3)	(69.8)	282.0	3.9	35.4		288.2	40.4	
EBITDA growth	(78.2)	160.4	(102.4)	229.0	(819.0)	(61.4)		159.4	(96.9)	2485.6	505.9
Pretax profit growth	(142.7)	(152.4)	(63.0)	(4.8)	(18.7)	110.9	(144.3)		(125.8)	(20.7)	
Net profit growth	(143.8)	(158.4)	(64.4)	(17.8)	(6.8)	85.3	(138.5)		(128.6)	(10.5)	

Source: Company data, KGI Research estimates

Balance sheet

NTS\$mn	Dec-21A	Dec-22A	Dec-23A	Dec-24F	Dec-25F
Total assets	5,029	5,424	5,336	5,206	5,407
Current assets	4,495	4,422	3,602	3,091	3,329
Cash & ST securities	4,185	4,098	2,968	2,462	2,695
Inventory	1	2	2	(1)	(1)
Accounts receivable	155	111	200	216	221
Other current assets	155	211	431	415	415
Non-current assets	534	1,002	1,734	2,114	2,078
LT investments	-	-	-	-	-
Net fixed assets	25	75	96	69	33
Other assets	510	927	1,638	2,045	2,045
Total liabilities	258	435	525	479	479
Current liabilities	175	321	399	351	351
Accounts payable	3	-	-	0	0
Interest bearing ST liabilities	-	-	-	-	-
Other current liabilities	172	321	399	351	351
Non-current liabilities	83	114	127	128	128
Long-term debt	-	-	-	-	-
Other L-T liabilities	-	43	45	59	59
Total equity	4,771	4,989	4,811	4,727	4,928
Share capital	507	507	507	507	507
Retained earnings reserve	162	356	145	54	255
Minority interests	-	-	-	-	-
Preferred shareholders funds	-	-	-	-	-

Key ratios

	Dec-21A	Dec-22A	Dec-23A	Dec-24F	Dec-25F
Growth					
Revenue growth	41.1%	13.7%	13.5%	22.9%	37.6%
Operating profit growth	321.7%	(143.6%)	288.2%	40.4%	-
EBITDA growth	119.6%	(58.9%)	(96.9%)	2485.6%	505.9%
Net profit growth	360.0%	120.2%	(128.6%)	(10.5%)	-
EPS growth	335.4%	95.9%	(128.6%)	(10.5%)	-
Profitability					
Gross profit margin	99.8%	99.9%	99.9%	99.9%	99.9%
Operating margin	19.4%	(7.4%)	(25.4%)	(29.0%)	4.4%
EBITDA margin	37.4%	13.5%	0.4%	7.8%	34.2%
Net profit margin	19.7%	38.2%	(9.6%)	(7.0%)	11.3%
Return on average assets	5.0%	6.8%	(1.9%)	(1.7%)	3.8%
Return on average equity	5.4%	7.3%	(2.1%)	(1.9%)	4.2%
Stability					
Gross debt to equity	0.0%	0.0%	0.0%	0.0%	0.0%
Net debt to equity	Net cash	Net cash	Net cash	Net cash	Net cash
Interest coverage (x)	100.3	222.8	(43.6)	(30.4)	127.3
Interest & ST debt coverage (x)	1.0	1.0	1.0	1.0	1.0
Cash flow interest coverage(x)	174.6	415.1	(31.1)	133.4	365.7
Cash flow/int. & ST debt (x)	174.6	415.1	(31.1)	133.4	365.7
Current ratio (x)	25.7	13.8	9.0	8.8	9.5
Quick ratio (x)	25.7	13.8	9.0	8.8	9.5
Net debt (NT\$mn)	(4,005)	(4,098)	(1,890)	(2,462)	(2,695)
Per share data					
EPS (NT\$)	3.59	7.03	(2.01)	(1.80)	3.97
CFPS (NT\$)	6.91	14.18	(1.36)	6.58	14.39
BVPS (NT\$)	94.20	98.50	94.98	93.32	97.30
Adj BVPS (NT\$)	105.88	98.50	94.98	93.32	97.30
SPS (NT\$)	18.19	18.40	20.88	25.67	35.33
EBITDA/share (NT\$)	6.80	2.49	0.08	1.99	12.08
Cash DPS (NT\$)	2.85	1.50	-	-	0.79
Activity					
Sales / avg assets	0.25	0.18	0.20	0.25	0.34
Days receivable	68.8	43.6	68.9	60.9	45.1
Days inventory	281.6	1,097.5	952.6	(514.2)	(199.2)
Days payable	727.0	-	-	8.8	2.4
Cash cycle	(376.6)	1,141.1	1,021.6	(462.1)	(156.5)

Source: Company data, KGI Research estimates

Profit & loss

NTS\$mn	Dec-21A	Dec-22A	Dec-23A	Dec-24F	Dec-25F
Revenue	820	932	1,058	1,300	1,789
Cost of goods sold	(1)	(1)	(1)	(1)	(2)
Gross profit	818	931	1,057	1,299	1,788
Operating expenses	(660)	(1,000)	(1,325)	(1,676)	(1,708)
Operating profit	159	(69)	(268)	(377)	79
Non-operating income	24	71	163	125	114
Interest income	4	63	154	116	114
Investment income	-	-	-	-	-
Other non-op income	20	9	10	9	-
Non-operating expenses	(5)	381	6	173	58
Interest expense	(2)	(2)	(2)	(2)	(2)
Investment loss	-	-	-	-	-
Other non-op expenses	(3)	383	8	176	60
Pre-tax profit	177	384	(99)	(79)	252
Current taxation	(15)	(28)	(3)	(12)	(50)
Minorities	-	-	-	-	-
Extraordinary items	-	0	0	0	-
Net profit	162	356	(102)	(91)	201
EBITDA	306	126	4	101	612
EPS (NT\$)	3.59	7.03	(2.01)	(1.80)	3.97

Cash flow

NTS\$mn	Dec-21A	Dec-22A	Dec-23A	Dec-24F	Dec-25F
Operations cash flow	311	718	(69)	333	729
Net profit	162	356	(102)	(91)	201
Depreciation & amortisation	148	195	272	478	533
Decrease in working capital	(38)	41	(118)	(13)	(5)
Other operating cash flow	40	126	(122)	(41)	0
Investing cash flow	(225)	(469)	(2,035)	246	(496)
Sale of ST investment	-	180	(1,078)	1,078	-
New investments	-	-	-	-	-
Capital expenditure	(9)	(60)	(51)	(24)	(54)
Others investing cashflow	(216)	(589)	(906)	(808)	(442)
Free cash flow	123	(52)	(393)	(405)	95
Financing cash flow	3,394	(164)	(102)	(16)	-
Increase in short term debt	-	-	-	-	-
Increase in long term loans	-	-	-	-	-
New ordinary shares issued	3,447	-	-	-	-
Ordinary dividends paid	(32)	(144)	(76)	-	-
Other financing cashflow	(21)	(19)	(26)	(16)	-
Forex effects	(2)	7	(1)	8	-
Total cash generated	3,478	93	(2,208)	572	233

ROIC

	Dec-21A	Dec-22A	Dec-23A	Dec-24F	Dec-25F
1 - COGS/revenue					
- Operating exp./revenue	80.5%	107.3%	125.3%	128.9%	95.5%
= Operating margin	19.4%	(7.4%)	(25.4%)	(29.0%)	4.4%
1 / (Working capital/revenue	0.2	0.0	0.2	0.2	0.2
+ Net PPE/revenue	0.0	0.1	0.1	0.1	0.0
+ Other assets/revenue)	0.0	0.2	0.3	0.4	0.3
= Capital turnover	4.2	3.3	1.5	1.5	2.1
Operating margin	19.4%	(7.4%)	(25.4%)	(29.0%)	4.4%
x Capital turnover	4.2	3.3	1.5	1.5	2.1
x (1 - tax rate)	91.3%	92.8%	102.7%	115.9%	80.0%
= After-tax ROIC	74.9%	(22.6%)	(39.7%)	(48.8%)	7.4%

Source: Company data, KGI Research estimates

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