INDUSTRY REPORT

Taiwan

凱基亞洲 KGI ASIA

Thermal sector

Liquid cooling to penetrate AI server & auto markets

Key message

We expect strong growth of AI server deployments in 2024 to accelerate the adoption of 3D vapor chambers (VC, air cooling) and cold plates (liquid cooling) as thermal solutions. New automobile features, such as autonomous driving with advanced driver assistance systems (ADAS), will also increase thermal design power (TDP), which will accelerate the liquid cooling trend. We believe AI server thermal solution upgrades, such as liquid cooling, will benefit Auras Technology (3324 TT, NT$321, OP), Asia Vital Components (AVC; 3017 TT, NT$345, NR), and Sunonwealth Electric Machine (2421 TT, NT$117, OP). We maintain our target price of NT$400 (20x average 2024-25F EPS) for Auras, and NT$160 (20x average 2024-25F EPS) for Sunonwealth.

Event

We expect strong growth in AI server deployments in 2024 to accelerate the adoption of 3D vapor chambers (VC, air cooling) and cold plates (liquid cooling) as thermal solutions. New automobile features, such as autonomous driving with advanced driver assistance systems (ADAS), will also have increased thermal design power (TDP), which will accelerate the adoption of liquid cooling solutions within the auto sector.

Impact

AI server demand growth to lead to greater liquid cooling adoption. Since the launch of ChatGPT, the AI server uptrend has become more secure. We forecast training AI (with A100/H100/MI300/TPU) server shipments will grow 56% YoY to 191k units in 2023, and 200% YoY to 572k units in 2024. With an additional 300-750W per GPU (A100/H100/MI300), the TDP of an AI server will expand sharply to 4-7 kW. Although air cooling is still able to dissipate heat from currently deployed CPU/GPUs, some end users (CSP or server brands) will have different considerations for their thermal solutions. VC and 3D VC designs are two air cooling design upgrades for AI servers, as opposed to the heat pipe designs made for general servers. However, these upgraded designs require higher chassis (6-7U, including GPU and CPU trays), and will thus cause lower density for each server rack. Cold plate adoption for AI servers can increase rack density, as server chassis height can be lowered to 4-5U, allowing data centers to achieve the same computational power with 66% less rack space vs. traditional air-cooled servers, according to Nvidia's (US) tests. Furthermore, liquid cooling has better power usage effectiveness (PUE) metrics of 1.1-1.2, versus air cooling's 1.5-1.6, which could reduce server rack energy consumption by 28%. Although the capital cost (ASP) of liquid cooling solutions is higher than for air cooling, operational costs can be reduced, as cooling systems account for approximately 33% of the total energy consumption in data centers. As a result, there has been a significant increase in liquid cooling test cases in 2023, and we will enter an era of concurrent air cooling and liquid cooling in 2024-25F. The supply chain expects 3D VC to be used as a transitional solution, before liquid cooling becomes increasingly ubiquitous.

3D VC and liquid cooling to fuel thermal ASP and gross margin. GPUs, CPUs, and switches will generate more heat in AI servers, to TDP of over 4-7 kW, making liquid cooling more attractive as a solution. Liquid cooling (closed-loop, with air-to-liquid cooling) designs have double the ASP of their 3D VC equivalents, with a cold plate and cooling distribution unit (CDU) equipped. ASP will be even higher for open loop designs (liquid-to-liquid) with a rack, fan door, and manifold equipped. Although liquid cooling thermal solutions will make limited contributions to margins in 2023F, they will be more significant in 2024-25F on increased AI server shipments. ESG considerations are a driving force for the adoption of liquid cooling solutions, due to their lower PUE. Cooler Master Technology (TW; unlisted), CoolIT Systems (CA), Auras Technology (3324 TT, NT$321, OP), Asia Vital Components (AVC; 3017 TT, NT$345, NR), Sunonwealth Electric Machine (2421 TT, NT$117, OP) and Delta (2308 TT, NT$333, OP) are major liquid cooling suppliers which will benefit from this trend. We also expect the ADAS trend to increase demand for liquid cooling in the long run, as ADAS is upgraded from Level 2 to Level 4/5.

Positive on thermal plays' 4Q23-2024 sales and earnings outlooks. Server sales in 1H23 accounted for 33% of total sales for AVC, 23% for Auras, and 26% for Sunonwealth. We expect their server sales to expand in 2H23-2024, resulting in higher gross margins. AI servers' thermal content values are 5-10x higher than non-AI servers, due to upgraded dual-motor cooling fans, the adoption of VC, 3D VC, or cold plates with CDU, with more of these needed for each additional GPU. As AI server shipments will expand in 4Q23, 3D VC and liquid cooling projects will commence, and general-purpose server demand will gradually recover with new Eagle Stream and Genoa CPU platforms, we expect most thermal plays' 4Q23 sales to grow QoQ and YoY. AVC, Auras, and Sunonwealth's 4Q23 sales will grow by single-digits, QoQ, and we expect their 2024 sales to grow 15-22%. With gross margin expansion expected, we forecast 2024 EPS of NT$18.42 for Auras, up 35% YoY, and NT$7.43 for Sunonwealth, up 24% YoY. Consensus 2024 EPS for AVC is NT$16.94, up 28% YoY.

Stocks for Action

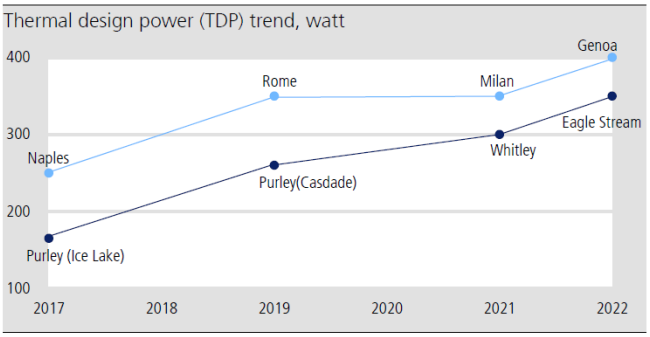
We expect thermal solution upgrades, including liquid cooling, to benefit Auras, AVC, and Sunonwealth. We maintain our target price of NT$400 (20x average 2024-25F EPS) for Auras, and NT$160 (20x average 2024-25F EPS) for Sunonwealth.

Risks

Materials price hikes; NT-dollar appreciation; weak demand for servers.

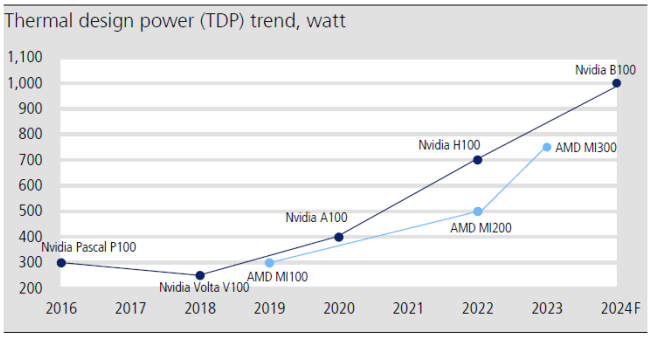
Server, AI server and thermal TDP trend

Figure 1: Rising TDP trend for server CPUs, reaching 400W for Genoa CPU



Source: Company data, KGI Research

Figure 2: Higher TDP for AI server GPUs



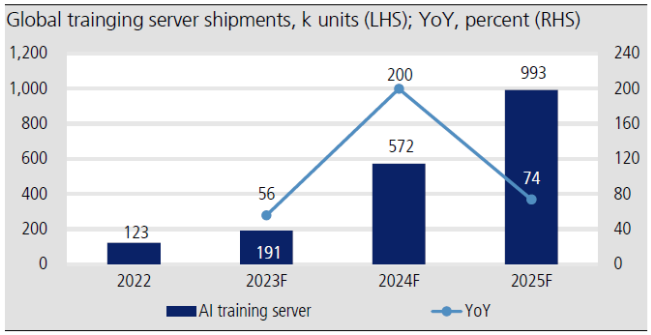
Source: Company data, KGI Research

Figure 3: Server platforms to launch by Intel & AMD in 2023F

Platform	Intel Purley	Intel Purley	Intel Cedar Island	Intel Whitley	Intel Eagle Stream	Intel Eagle Stream	Intel Birch Stream	AMD Zen 2	AMD Zen 3	AMD Zen 4	AMD Zen 4c	AMD Zen 4	AMD Zen 5
Time of launch	3Q17	3Q19	2H20	2Q21	1Q23	2H23F	2024F	2Q19	1Q21	4Q22	1H23F	2023F	2024F
CPU	Skylake-EP Cannon Lake-EP	Cascade Lake	Cooper Lake	Ice Lake	Sapphire Rapids (Intel 7)	Emerald Rapids (Intel 7)	Granite Rapids (Intel 3)	Rome	Milan	Genoa	Bergamo	Siena	Turin
Process	14nm/ 14nm+	14nm++	14nm	10nm	10nm	10nm++	7nm	7nm	7nm+	5nm	5nm	5nm	3nm / 4nm
CPU sockets	LGA 3647	LGA 3647	LGA 4189	LGA 4189	LGA 4677	LGA 4677	LGA 7529	FC LGA 4094	FC LGA 4094	FC LGA 6096	FC LGA 6096	FC LGA 4844	FC LGA 6096
CPU cores	28	28	48	26	60	64	120	64	64	96	128	64	256
DRAM	6-channel DDR4	6-channel DDR4	8-channel DDR4	8-channel DDR4	8-channel DDR5	DDR5	DDR5	8-channel DDR4	8-channel DDR4	12-channel DDR5	DDR5	DDR5	TBA
PCIe	PCIe 3.0	PCIe 3.0	PCIe 3.0	PCIe 4.0	PCIe 5.0	PCIe 5.0	PCIe 5.0	PCIe 4.0	PCIe 4.0	PCIe 5.0	PCIe 5.0	PCIe 5.0	TBA
CPU TDP	45-165W	165-250W	up to 300W	up to 270W	up to 350W	350-400W	400W+	120-225 W	225-280W	320-400W	320-400W	70-225W	480-600W

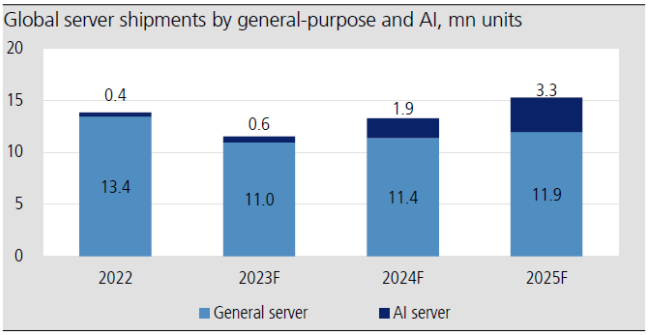
Source: Company data, KGI Research

Figure 4: Training server shipments to grow from 191k units in 2023F to 572k in 2024F



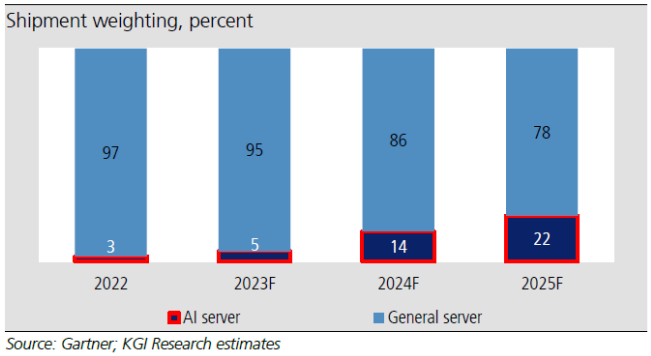
Source: Gartner; KGI Research estimates

Figure 5: AI servers (training & inference) to boost server uptrend



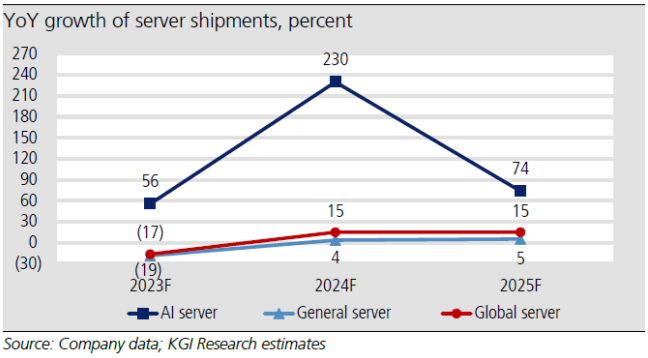
Source: Gartner; KGI Research estimates

Figure 6: AI weighting of server shipments to expand from 5% in 2023F to 22% in 2025F



Source: Gartner; KGI Research estimates

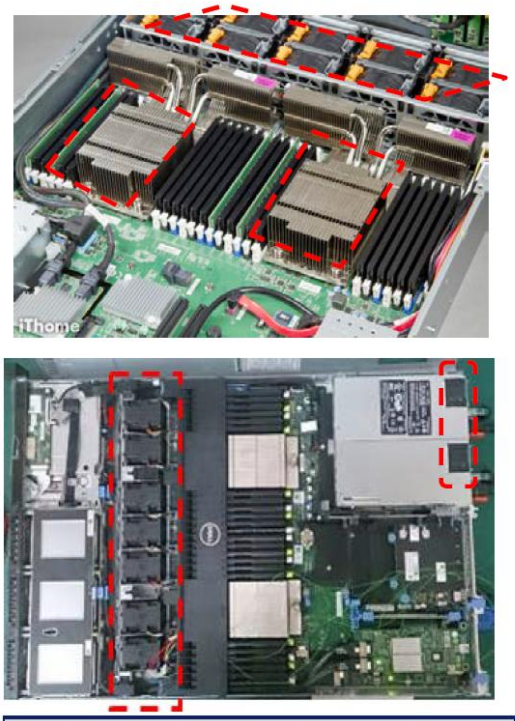
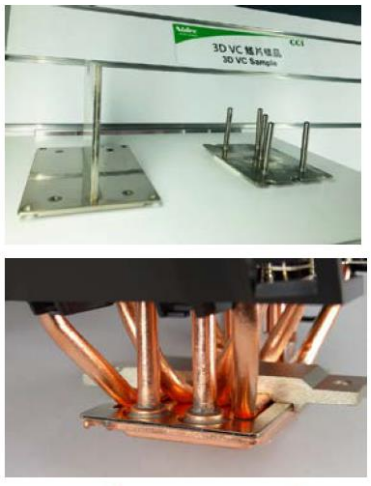
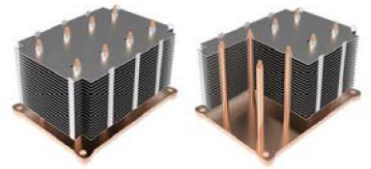
Figure 7: AI servers will outgrow general servers in 2023-25F



Source: Company data; KGI Research estimates

Thermal design in air & liquid cooling

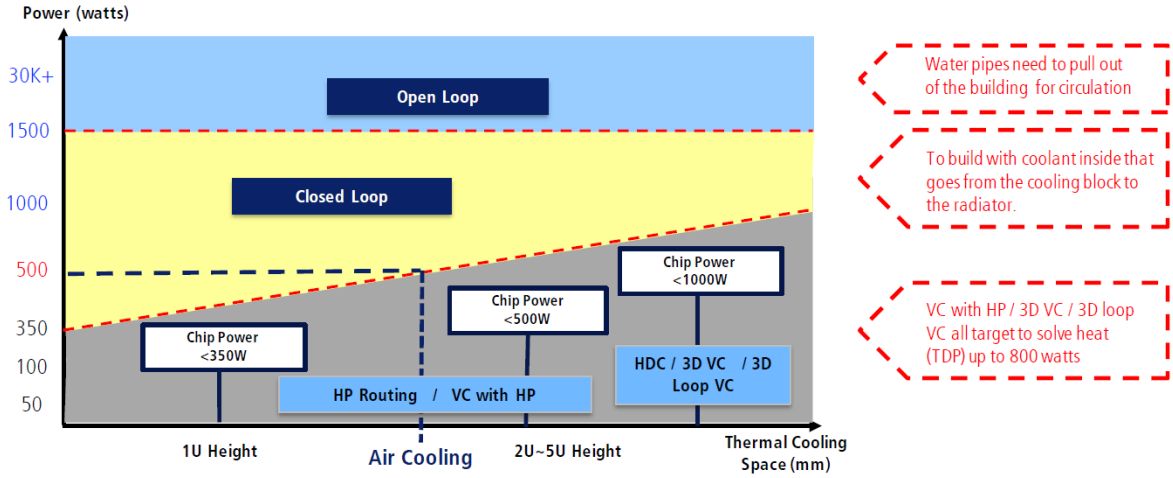
Figure 8: Server CPU upgrades to adopt 3D VC thermal designs before transitioning to liquid cooling designs

Air cooling design	3D VC cooling design	Liquid cooling (cold plate)
	 	  
Heat pipe, fins and cooling fans	Connect heat pipe (cylinder) with vapor chamber in the bottom	Including cold plate module, CDU and rack

Source: Company data, KGI Research

Figure 9: Thermal makers to maximize heat dissipation via air cooling to 800 watts, while migrating to liquid cooling under higher computing power

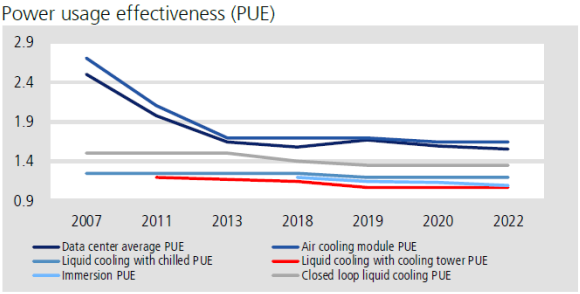
Thermal cooling, mm (x-axis); power, watts (y-axis)

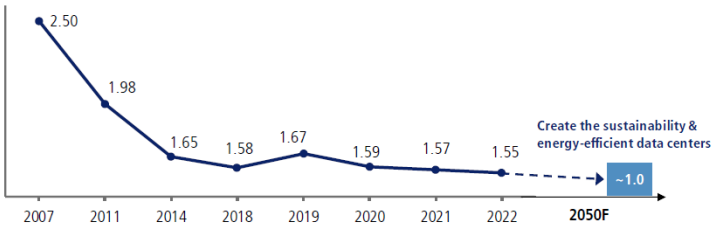


Source: Auras; KGI Research

Figure 10: ESG considerations will become a driving force for adopting liquid cooling designs, due to better PUE

Power usage effectiveness (PUE)



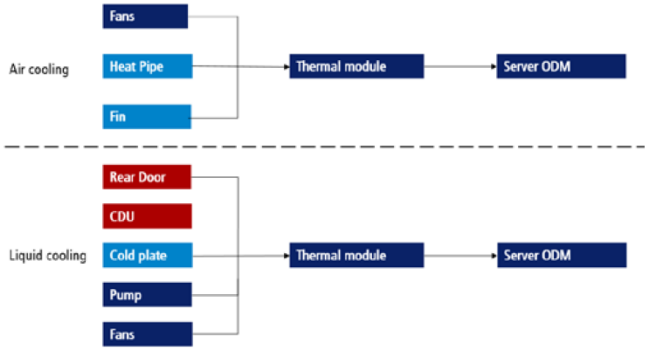


Source: Auras; KGI Research

Figure 11: Liquid cooling to be utilized for autopilot/ADAS systems higher than Level 3

Source: Auras

Figure 12: Liquid cooling brings business opportunities for thermal module plays & some new plays



Source: KGI Research

Comparison - Thermal plays' business & financials

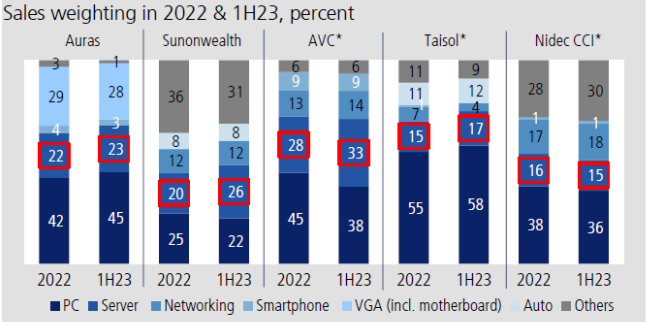
Figure 13: Thermal peers comparison – thermal sales and product mix

		Thermal sales (NT$bn)				YoY (%)				Total sales weighting by application in 2022 (%)							
Company	Ticker	2022	1H23	2023F	2024F	2022	1H23	2023F	2024F	PC	Gaming/ VGA	Smartphone	Server	Networking	Auto	others	Total
Auras	3324 TT	13.9	5.9	12.9	15.7	(2.8)	(17.2)	(7.1)	21.7	42	29	4	22		1-3	1	100
Sunonwealth	2421 TT	14.1	6.4	13.5	15.9	3.7	(3.8)	(4.2)	18.2	25			20	12	8	35	100
AVC*	3017 TT	31.2	26.7	33.9	39.3	21.8	3.4	8.6	16.1	45		9	28	13	<1	5	100
Taisol*	3338 TT	4.6	1.7	3.7	4.2	(8.2)	(30.6)	(19.3)	14.8	55		1	15	7	11	11	100
Nidec CCI*	6230 TT	11.9	5.7	11.7	12.4	8.0	9.4	(1.3)	5.3	31			15	15	<1	39	100

Source: Company data; KGI Research
**Bloomberg consensus*

Figure 14: Most thermal plays keep expanding server sales weighting

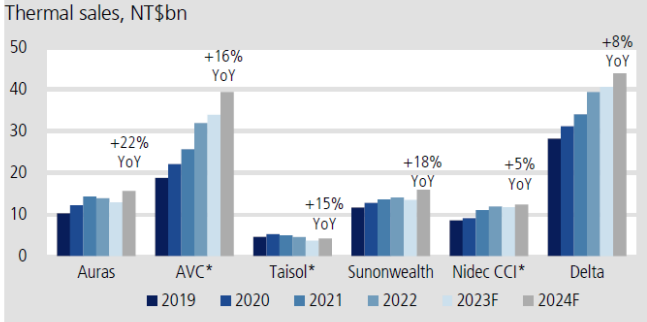
Sales weighting in 2022 & 1H23, percent



Source: Company data; KGI Research

Figure 15: Thermal sales to recover double digit YoY growth in 2024F for most companies

Thermal sales, NT$bn



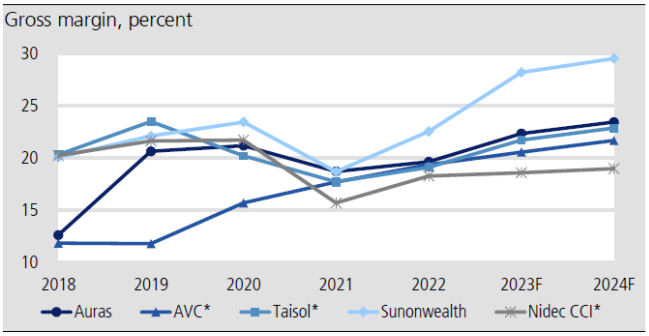
** Bloomberg consensus*
Source: Company data; KGI Research estimate

Figure 16: Thermal peer comparison – earnings

		EPS (NT$)				EPS YoY(%)				GM (%)				OPM (%)			
Company	Ticker	2022	1H23	2023F	2024F	2022	1H23	2023F	2024F	2022	1H23	2023F	2024F	2022	1H23	2023F	2024F
Auras	3324 TT	14.68	6.00	13.61	18.42	11.9	(20.7)	(7.3)	35.4	19.6	21.6	22.4	23.5	8.5	8.8	11.6	12.5
Sunonwealth	2421 TT	4.34	2.83	6.01	7.43	153.7	56.4	38.5	23.7	22.5	27.3	28.2	29.5	8.0	11.9	13.3	15.1
AVC*	3017 TT	11.78	6.03	13.22	16.94	43.5	15.7	12.2	28.1	19.4	20.0	20.6	21.7	11.3	10.9	11.9	13.6
Taisol*	3338 TT	3.05	1.04	2.74	3.53	43.2	(35.0)	(10.2)	28.8	19.1	20.1	21.7	22.9	6.0	5.2	7.8	10.0
Nidec CCI*	6230 TT	7.10	4.15	8.56	7.91	75.3	174.8	20.6	(7.6)	18.3	18.2	18.6	19.0	6.7	6.3	7.0	7.5

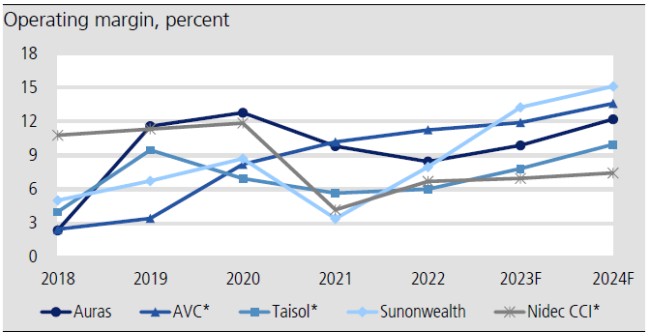
**Bloomberg consensus*
Source: Bloomberg; KGI Research estimates

Figure 17: Gross margin uptrend in 2023-24F



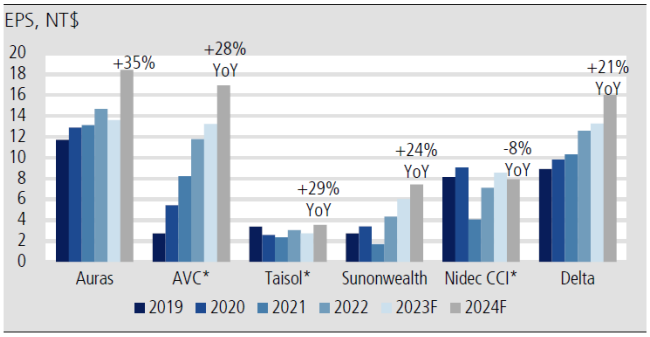
*Source: Company data; KGI Research estimate; * Bloomberg consensus*

Figure 18: Sunonwealth, Auras & AVC's operating margins outgrowing peers



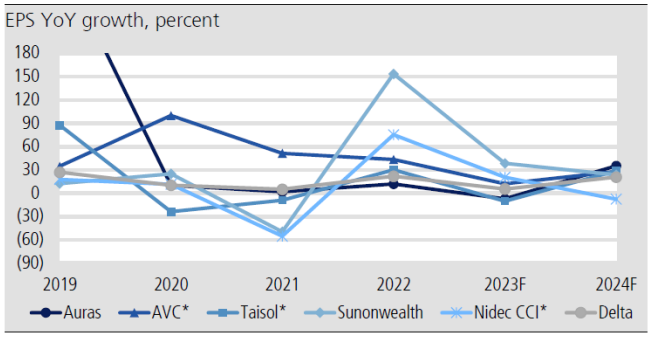
*Source: Company data; KGI Research estimate; * Bloomberg consensus*

Figure 19: Margin expansion to boost thermal play's earnings growth in 2024F with sales recovery



*Source: Company data; KGI Research estimate; * Bloomberg consensus*

Figure 20: Most thermal plays' EPS to fall YoY in 2023F, but will grow over 20% YoY in 2024F



*Source: Company data; KGI Research estimate; * Bloomberg consensus*

Figure 21: Peer comparison – Valuations

Sector	Company	Ticker	Market cap. (US$mn)	Share price (LCY)	Rating	Target Price (LCY)	EPS (LCY)		EPS YoY (%)		PE (x)		PB (x)		ROE (%)		Cash yield (%)	
							2023F	2024F	2023F	2024F	2023F	2024F	2023F	2024F	2023F	2024F	2022	2023F
Cooling fan	Sunonwealth	2421 TT	908	117.0	Outperform	160.0	6.01	7.43	38.5	23.7	19.5	15.7	5.2	4.8	27.8	31.6	2.2	3.6
	Nidec Corp*	6594 JP	27,297	6,825.0	Not rated	N.A.	138.97	309.78	(40.2)	122.9	49.1	22.0	3.3	3.0	7.0	12.7	1.0	1.0
	Minebea Mitsumi*	6479 JP	6,869	2,398.0	Not rated	N.A.	181.92	161.62	7.0	(11.2)	13.2	14.8	1.9	1.7	13.2	10.1	1.5	1.7
Thermal module/ Cooling fan	AVC*	3017 TT	4,089	345.0	Not rated	N.A.	13.22	16.94	13.5	28.1	26.1	20.4	7.3	6.6	27.8	29.8	1.6	1.8
	Delta Elec	2308 TT	26,749	333.0	Outperform	401.0	13.26	16.02	5.5	20.8	25.1	20.8	4.7	4.2	18.5	21.2	3.0	2.3
Thermal module	Nidec CCI*	6230 TT	390	146.0	Not rated	N.A.	8.56	7.91	20.6	(7.6)	17.1	18.5	N.A.	N.A.	N.M.	N.M.	0.7	N.A.
	Auras	3324 TT	877	321.0	Outperform	400.0	13.61	18.42	(7.3)	35.4	23.6	17.4	4.6	4.0	19.9	23.8	2.0	1.8
	Taisol*	3338 TT	164	60.40	Not rated	N.A.	2.74	3.53	(10.2)	28.8	22.0	17.1	3.0	2.8	13.0	16.2	3.3	3.2
	Foxconn Tech*	2354 TT	2,498	57.1	Not rated	N.A.	4.34	5.41	43.7	24.7	13.2	10.6	0.6	0.5	5.8	7.0	2.8	2.6
	Fujikura Ltd*	5803 JP	2,200	1,108.5	Not rated	N.A.	159.49	156.65	12.4	(1.8)	7.0	7.1	1.6	1.2	18.5	14.9	0.9	2.4
	Furukawa Elect*	5801 JP	1,062	2,240.0	Not rated	N.A.	219.11	154.58	52.8	(29.4)	10.2	14.5	0.6	0.5	5.4	3.5	2.7	2.7

Bloomberg consensus
Source: Bloomberg; KGI Research estimates

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