IT Hardware

CES' AI focus creates opportunities for PC hardware firms

Key message

1. The four major focuses of 2024 CES include: AI PCs, WiFi 7 IoT applications and smart homes, AR/VR, and electric vehicles/ self-driving cars.
2. US tech giants showcased several new CPUs & GPUs for AI PC products across CES, with many application launches.
3. We are positive on a PC sales recovery, boosted by AI proliferation and new GPUs in 2H24-2025F, with the gaming and commercial markets benefitting. Beneficiaries of AI PC proliferation include PC brands, ODMs, and memory, memory connector, thermal and battery makers.

Event

CES 2024, the world's largest consumer electronics show, runs from January 9-12 with a slew of new product launches by tech heavyweights. While the event is usually headlined by the presence of flashy concept cars, new PCs and TVs, the market is paying close attention to artificial intelligence (AI) applications this year.

Impact

US tech giants to showcase several new CPUs & GPUs with PC products. The show-before-the-show saw major announcements from Intel (US), AMD (US), Nvidia (US), and their hardware partners. They revealed new GPUs, processors, AI notebooks, and gaming handhelds. AMD held a digital presentation to launch a new accelerated processing unit (APU), and a series of chips for the aging AM4 platform, as well as the Radeon RX 7600XT GPU. AMD also showcased the Ryzen 8000G Phoenix APU, designed to bring AI to desktop PCs. Nvidia launched the new RTX 40-series Super graphics cards, and made a few announcements about gaming notebooks this year. Meanwhile, Intel introduced a series of new processors across its mobile and desktop lines. We saw 14th Gen Intel Core chips showcased for laptops and desktops, and Core Mobile Processors for thinner laptops, including: 1) new 14th-Gen Raptor Lake-refresh processors; 2) HX-series CPUs, which are refreshed chips with up to 24 cores, 5.8 GHz boost clock, and 192GB DDR5 support; and 3) Core Processors Series 1, which are new 15W U chips for low-power systems. With Arrow Lake and Lunar Lake CPUs arriving in 2H24F, demonstrating three times more AI performance for both GPUs and Neural Processing Units (NPU), the adoption of these new platforms are likely to induce upgrade demand across a wide range of technologies in 2024-25F, including DDR5, PCIe Gen5, Thunderbolt 5, Wi-Fi 7, and Bluetooth 5.4.

AI application launches showcased across CES. While we see four major key focuses for CES 2024: 1) AI PCs and smartphones; 2) WiFi 7 IoT applications and smart homes; 3) AR/VR and home entertainment; and 4) electric vehicles/self-driving cars, we see AI as the key attraction for the market's attention. As more generative AI applications develop for content creation, or to improve efficiency for autonomous machines or robots, we believe software, chip, and hardware companies will bet heavily on AI, and build off of this trend moving forward. Besides traditional IT products, CES has become a car show in recent years, and automakers, including BMW (DE), Ford (US), and GM (US), have a large presence. Increased use of AI in cars will also be a major theme, as well as advanced driving assistance systems and autonomous driving. To compete with Nvidia's DRIVE Orin platform for powering its smart autonomous driving system, AMD also announced two 7nm process automotive chips at CES 2024, including Versal Edge automotive-grade self-adaptive SoC, an advanced AI engine to help control a new generation of advanced automotive systems and applications, and the Ryzen V2000A series, focused on infotainment consoles, digital instruments and passenger display screens.

PC recovery boosted by the AI trend and new GPUs in 2H24-2025F; gaming and commercial market to benefit. We expect AI to drive device upgrades after CES this year. Intel is aiming to enable AI functionality on more than 100mn PCs by 2025F, for a 30-35% penetration rate of new PCs sold, and targets AI PC penetration of 80% of the new PC market by 2028F. We think AI-enabled PCs with AI and machine-learning capabilities will assist users with the creation, editing, optimization, and compression of audio and video. They may also improve the quality and efficiency of workloads, protect user data and privacy, and prevent various security threats and attacks. Following the launch of Windows 12 and the debut of new AI software, we expect more AI PC models to launch in 2H24-2025F, which would be another driver of PC industry growth. Defined as a PC with an NPU, AI PC penetration will reach 15-20% of total PC shipments in 2024F, approximately 40-50mn units, and over 30% in 2025F, benefitting PC brands. The AI PC trend will also spur growth in commercial PC market demand, and new GPU launches by Nvidia and AMD should enhance gaming PC market growth in 2024-25F. NB ODMs will see PC demand rise in 2024-25F, and the AI server market will continue to grow, driving sales and profits. To meet higher computing performance requirements, we believe memory and memory connectors will be upgraded, and thermal solution demand will be enhanced by rising thermal design power (TDP). These component companies' notebook PC application sales will increase on spec upgrades.

Stocks for Action

We expect Asustek (2357 TT, NT$461, OP), Quanta Computer (2382 TT, NT$224, OP), and Inventec (2356 TT, NT$51, OP) to benefit from an AI PC demand uptrend, and memory connector, thermal, and battery makers will also benefit.

Risks

Weak demand; further ASP or margin contractions.

Figure 1: AMD's Ryzen 8000G series CPU for desktop

Source: AMD

Figure 2: AMD's AI portfolio

Source: AMD

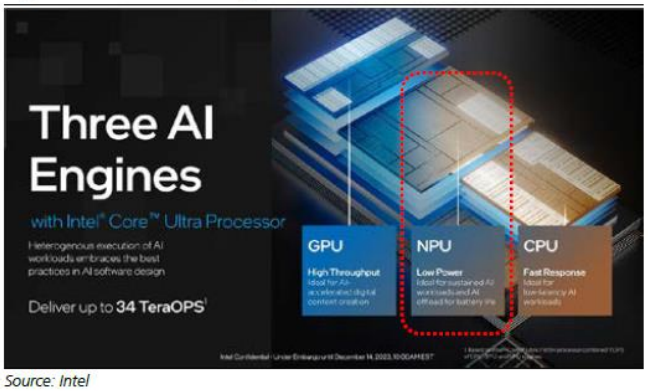
Figure 3: Intel announced Core CPU

Source: Intel

Figure 4: All NB brands launch models with Intel's new CPU

Source: Intel

Figure 5: NPU is the key for AI PC



Source: Intel

Figure 6: Nvidia's RTX 40-Super GPUs launch

Source: Nvidia

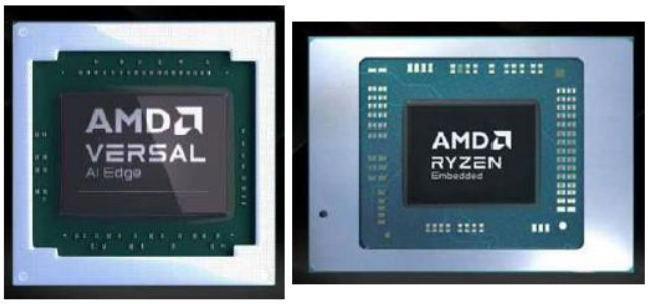
Figure 7: 230+ Meteor Lake models launched by ODM partners

Source: Intel

Figure 8: Positive reviews of Meteor Lake

Source: Intel

Figure 9: AMD announced two 7nm process automotive chips



Source: AMD

Figure 10: Qualcomm says over 350mn cars have Snapdragon chips

Source: Qualcomm

Figure 11: Nvidia's GPU engine specs –RTX 40 SUPER series has better performance at similar or lower MSRP than the initial launch prices of non-SUPER series

	RTX 4060	RTX 4060 Ti	RTX 4070	RTX 4070 SUPER	RTX 4070 Ti	RTX 4070 Ti SUPER	RTX 4080	RTX 4080 SUPER	RTX 4090
GPU Engine Specs									
Process	4nm	4nm	4nm	4nm	4nm	4nm	4nm	4nm	4nm
GPU Architecture	Ada Lovelace	Ada Lovelace	Lovelace	Ada Lovelace	Ada Lovelace	Ada Lovelace	Ada Lovelace	Ada Lovelace	Ada Lovelace
GPU Cores	3072	4352	5888	7168	7680	8448	9728	10240	16384
Boost Clock (MHz)	2460	2535	2475	2475	2610	2610	2505	2550	2520
Base Clock (MHz)	1830	2310	1920	1980	2310	2340	2205	2295	2230
Memory Specs									
Memory Speed	17 Gbps	18 Gbps	21 Gbps	21Gbps	21 Gbps	21 Gbps	22.4 Gbps	23Gbps	21 Gbps
Standard Memory Config	8 GB GDDR6	8 GB GDDR6	12 GB GDDR6X	12GB GDDR6X	12 GB GDDR6X	16GB GDDR6X	16 GB GDDR6X	16GB GDDR6X	24 GB GDDR6X
Memory Interface Width	128-bit	128-bit	192-bit	192-bit	192-bit	256-bit	256-bit	256-bit	384-bit
Memory Bandwidth (GB/sec)	272	288	504.2	504.2	504.2	672	736	736	1008
Thermal and Power Specs									
Graphics Card Power (W)	115	160	200	220	285	285	320	320	450
Supplementary Power Connectors	8 pin	8 pin	8 pin	8 pin	8 pin	8 pin	8 pin	8 pin	16 pin
Launch date	May 18, 2023	May 18, 2023	Apr 12, 2023	Jan 8,2024	Jan 3, 2023	Jan 8,2024	Sep 20, 2022	Jan 8,2024	Sep 20, 2022
Availability	June 29, 2023	May 24, 2023	Apr 13, 2023	Jan 17,2024	Jan 5, 2023	Jan 24,2024	Nov, 2022	Jan 31,2024	Oct 12, 2022
Launch price (US$)	299	399	599	599	799	799	1,199	999	1,599

Note: Specs in red denote spec upgrades
Source: Company data; KGI Research

Figure 12: AMD's GPU engine specs – spec upgrade on the RX 7600 XT GPU

	RX 7600	RX 7600 XT	RX 7700 XT	RX 7800 XT	RX 7900 XT	RX 7900 XTX
GPU Engine Specs	Navi 33	Navi 33	Navi 32	Navi 32	Navi 31	Navi 31
Process	6 nm	6 nm	5nm	5nm	5nm	5nm
GPU Architecture	RDNA 3	RDNA 3	RDNA 3	RDNA 3	RDNA 3	RDNA 3
GPU Cores	2048	2048	3456	3840	5376	6144
Boost Clock (MHz)	2655	2755	2544	2430	2394	2499
Base Clock (MHz)	1720	1720	1700	1295	1500	1855
Memory Specs						
Memory Speed	18Gbps	18Gbps	18Gbps	19.5Gbps	20Gbps	20Gbps
Standard Memory Config	8G GDDR6	16G GDDR6	12G GDDR6	16G GDDR6	20G GDDR6	24G GDDR6
Memory Interface Width	128-bit	128-bit	192-bit	256-bit	320-bit	384-bit
Memory Bandwidth (GB/sec)	288	288	432	624	800	960
Thermal and Power Specs						
Graphics Card Power (W)	165	190	245	263	300	355
Supplementary Power Connectors	8 pin	8 pin+ 8 pin	8 pin+ 8 pin	8 pin+ 8 pin	8 pin+ 8 pin	8 pin+ 8 pin
Launch date	May 24, 2023	Jan 8,2024	Aug 25, 2023	Aug 25, 2023	Nov 3, 2022	Nov 3, 2022
Availability	May 25, 2023	Jan 24,2024	Sep 6, 2023	Sep 6, 2023	Dec 13, 2022	Dec 13, 2022
Launch price (US$)	269	329	449	499	899	999

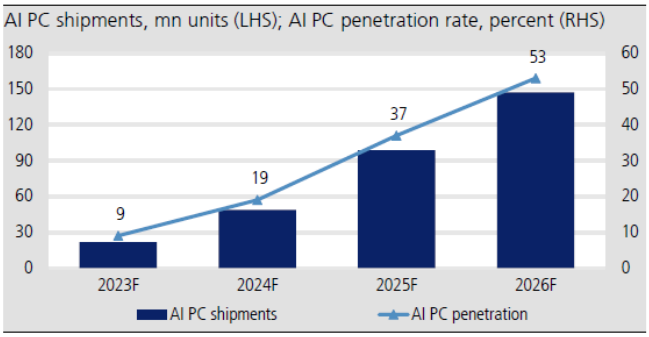
Note: Specs in red denote spec upgrades
Source: Company data; KGI Research

Figure 13: AI PCs to be aggressively pushed by CPU/NPU giants

Platform	Intel Meteor Lake	Intel Arrow Lake	AMD 7040 Phoenix	AMD 8040 Hawk Point	AMD 8050 Strix Point	Qualcomm Snapdragon X Elite
Microarchitecture	Redwood cove	Lion Cove	Zen 4	Zen 4	Zen 5	Oryon
Launch Date	4Q23	2H24F	2Q23	4Q23	2Q-3Q24F	1H24F
Process	Intel 4	Intel 20A	TSMC N4	TSMC N4	TSMC N4	TSMC N4
AI architecture	Movidius VPU	TBD	Ryzen AI	Ryzen AI	Ryzen AI	Hexagon
TOPS	34 TOPS	TBD	33 TOPS	39 TOPS	45-50 TOPS	45 TOPS

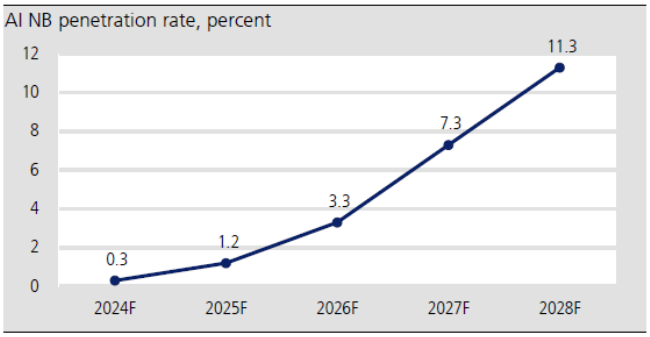
Source: Company data; KGI Research

Figure 14: AI PC penetration to exceed 50% by 2026F



Source: Canalys; KGI Research

Figure 15: AI NB penetration of 7.3% by 2027F, & over 10% by 2028F



Source: Omdia; KGI Research

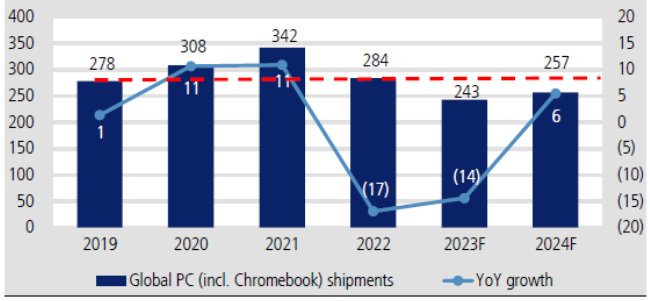
Figure 16: PC brands & CPU vendors' views on AI PCs

Brand	AI PC outlook
Asustek	* Management expects an AI PC penetration rate of single digits in 2024F, and double digits in 2025F, depending on user experiences and technology maturity. * Asustek expects upgrades for AI PC hardware and software, including NPUs and increased memory, boosting an ASP expansion. * Asustek will launch AI PCs for the commercial and high-end consumer markets.
Acer	* Management believes development of AI PC will gradually happen, and will change commercial and consumer market. * Management expects demand for AI PCs or AI-ready PCs to increase by the end of 2023, and holds a positive view on AI PCs.
Dell	* Management believes that the AI PC trend will upgrade PC hardware, requiring a larger CPU, more memory, increased storage, and better displays, among other improvements. * Management expects that a PC refresh cycle will occur in 2024F, with advances in AI-enabled architecture from Intel, AMD, and Windows on ARM.
HP	* Management guides AI PCs will be launched as early as next year, enabling cutomers access to AI at a lower cost. * Will launch the software platform "Z by HP AI Studio" in 2024F. * Management believes that by integrating AI capabilities into the PC, it will become approximately 80 percent less expensive, reduce latency, and offer significant advantages for data and privacy protection.
Lenovo	* Will launch AI PC in 3Q24F. * Lenovo's AI PC can run large language models, enabling edge computing, without a need for cloud processing.
Samsung	* It will launch a new Galaxy Book, equipped with an Intel Core Ultra CPU, in January 2024.
CPU firm	**AI PC outlook**
Intel	* Intel targets AI PC shipments to reach 100mn units (a 30-35% penetration rate) in the next two years, and will penetrate 80% of the overall market in 2028F. * Intel launched its mobile Meteor Lake CPU (Intel Core Ultra processor) in December, integrated with neural processing units (NPU) to support AI functions. * The Meteor Lake CPU can provide 1.7x generative AI performance and 2.5x better power efficiency than Raptor Lake generation * Intel will launch next-gen CPUs, including Arrow Lake, Lunar Lake and Panther Lake, offering more advanced performance and greater capabilities.
AMD	* AMD will launch the Ryzen 8040 processor (Hawk Point) in 2024F, providing stronger AI computing abilities. * It will launch a next-gen CPU, "Strix Point", in 2024F which will include AMD XDNA 2 architecture and deliver more than 3 times AI computing performance than the previous generation.
QCOM	* Qcom has introduced the X Elite CPU, on TSMC's 4nm process, which is designed for PCs, and has the capability to run complex Generative AI models. * Management expects PCs featuring the X Elite to be launched in mid-2024F.
NVDA	* Nvidia has released its TensorRT-LLM for Windows, which speeds on-device LLM inferences up by 4x.

Source: Company data; KGI Research

Figure 17: PC shipments to grow 6% YoY in 2024F

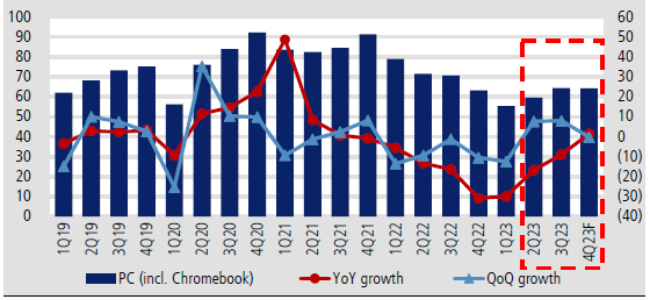
PC (incl. Chromebook) shipments, mn units (LHS); YoY growth, percent (RHS)



Source: Gartner, KGI Research estimates

Figure 18: YoY PC shipment decline has narrowed from 2Q23

PC (incl. Chromebook) shipments, mn units (LHS); YoY & QoQ growth, percent (RHS)



Source: Gartner, KGI Research estimates

Figure 19: Intel & AMD desktop CPU roadmap

	Rocket Lake	Alder Lake	Raptor Lake	Raptor Lake refresh	Meteor Lake	Arrow Lake	Panther Lake	Ryzen 4000 (Renoir)	Ryzen 5000 (Vermeer)	Ryzen 7000 (Raphael)	Ryzen 8000 (Granite Ridge)
Time for launch	1Q21	4Q21	4Q22	3Q23	2024F	2024F	2025F	1Q20	4Q20	3Q22	2024F
Process (node)	14nm+++++	Intel 7 (10nm)	Intel 7 (10nm)	Intel 7 (10nm)	Intel 4 (7nm)	Intel 20A	Intel 18A	TSMC N7	TSMC N7+	TSMC N5	TSMC N3
Microarchitecture (P-Core)	Cypress Cove	Golden Cove	Raptor Cove	Raptor Cove	Redwood Cove	Lion Cove	Cougar Cove	Zen 2	Zen 3	Zen 4	Zen 5
CPU sockets (desktop)	LGA 1200	LGA 1700	LGA 1700	LGA 1700	LGA 1851	LGA 1851	LGA 1851?	AM4 (LGA 1331)	AM4 (LGA 1331)	AM5 (LGA1718)	AM5 (LGA1718)
DRAM	DDR4	DDR4 / DDR5	DDR4 / DDR5	DDR4 / DDR5	DDR5 LPDDR5X	DDR5	TBD	DDR4	DDR4	DDR5	DDR5
PCIe	Gen 4	Gen 5	Gen 5	Gen 5	Gen 5	Gen 5	TBD	Gen 4	Gen 3	Gen 5	Gen 5

Source: Company data; KGI Research

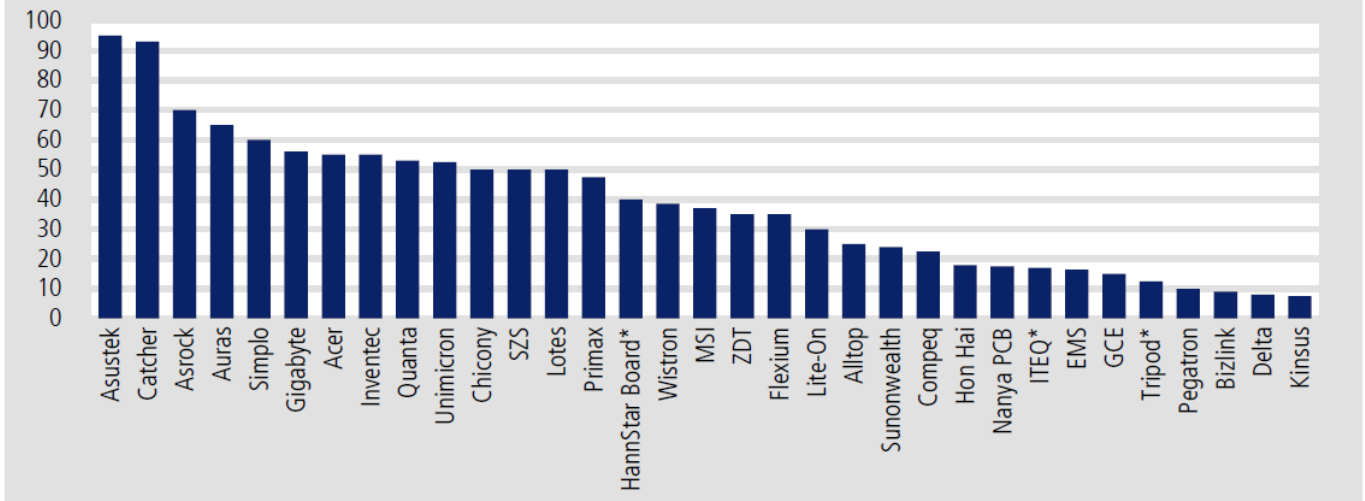
Figure 20: Intel & AMD NB CPU roadmap

	Rocket Lake	Alder Lake	Raptor Lake	Meteor Lake	Arrow Lake	Lunar Lake	Panther Lake	Ryzen 4000 (Renoir)	Ryzen 5000 (Cezanne)	Ryzen 6000 (Rembrandt)	Ryzen 7000 (Phoenix)	Ryzen 8040 (Hawk Point)	Ryzen 8000 (Strix Point)	Ryzen 9000 (Strix Halo)
Time for launch	1Q21	1H22	1H23	4Q23	2024F	2025F	2025F	1Q20	4Q20	1Q22	1Q23	4Q23	2024F	2025F
Process (node)	14nm+++++	Intel 7 (10nm)	Intel 7 (10nm)	Intel 4 (7nm)	Intel 20A	Intel 18A	Intel 18A	TSMC N7	TSMC N7+	TSMC N6	TSMC N4	TSMC N4	TSMC N4	TSMC N4
Microarchitecture (P-Core)	Cypress Cove	Golden Cove	Raptor Cove	Redwood Cove	Lion Cove	Lion Cove	TBD	Zen 2	Zen 3	Zen 3+	Zen 4	Zen 5	Zen 5	Zen 5
DRAM	DDR4	DDR4 / DDR5	DDR4 / DDR5	DDR5	TBD	TBD	TBD	DDR4	DDR4	DDR5	DDR5	DDR5	DDR5	DDR6?
PCIe	Gen 4	Gen 5	Gen 5	Gen 5	Gen 5	TBD	TBD	Gen 4	Gen 3	Gen 4	Gen 5	Gen 5	Gen 5	Gen 5

Source: Company data; KGI Research

Figure 21: PC brands, keyboard, hinge, power adapter, & PCB plays will benefit from PC demand recovery in 2024F

Weighting of PC & NB in total sales, percent



Source: Company data, KGI Research

Figure 22: IT hardware supply chain – Valuations

Company	Ticker	Related business	Market cap. (US$mn)	Share price (LCY)	Rating	Target Price (LCY)	EPS (LCY)			EPS YoY (%)			PE (x)			PB (x)			ROE (%)			Cash yield (%)	
							2023F	2024F	2025F	2023F	2024F	2025F	2023F	2024F	2025F	2023F	2024F	2025F	2023F	2024F	2025F	2023F	2024F
Asustek	2357 TT	Brand	11,032	461.0	Outperform	540.0	22.29	31.69	35.86	12.7	42.1	13.2	20.7	14.5	12.9	1.6	1.5	1.5	7.7	10.6	11.5	3.4	4.8
Acer*	2353 TT	Brand	4,753	48.4	Not rated	N.A.	1.72	2.10	2.32	3.2	22.0	10.2	28.1	23.0	20.9	2.0	1.9	1.8	7.0	8.3	9.1	2.9	3.5
MSI	2377 TT	Brand	5,022	184.5	Neutral	176.0	10.71	12.59	14.10	(9.2)	17.5	12.0	17.2	14.7	13.1	3.0	2.7	2.5	18.0	19.4	20.0	3.3	3.8
Gigabyte Tech	2376 TT	Brand	5,386	263.0	Outperform	285.0	7.72	12.47	16.00	(24.9)	61.5	28.3	34.1	21.1	16.4	4.4	4.1	3.7	13.3	20.1	23.6	1.8	2.9
Asrock	3515 TT	Brand	964	246.0	Neutral	245.0	7.01	11.12	12.33	(19.3)	58.6	10.9	35.1	22.1	20.0	3.5	3.4	3.2	10.3	15.6	16.4	1.9	3.0
Inventec	2356 TT	ODM	5,895	51.0	Outperform	53.0	1.57	2.42	2.93	(8.1)	54.3	20.9	32.5	21.1	17.4	3.0	2.9	2.8	9.4	14.1	16.5	2.5	3.8
Quanta	2382 TT	ODM	27,876	224.0	Outperform	310.0	10.13	13.43	17.52	34.8	32.6	30.4	22.1	16.7	12.8	4.9	4.6	4.3	22.6	28.4	34.8	3.6	4.8
Wistron Corp	3231 TT	ODM	9,118	97.6	Outperform	137.0	4.15	6.03	7.68	3.6	45.1	27.4	23.5	16.2	12.7	2.7	2.4	2.1	11.5	15.1	17.3	3.0	4.4
Hon Hai	2317 TT	ODM	44,888	100.5	Outperform	126.0	8.55	10.40	12.92	(16.2)	21.6	24.3	11.8	9.7	7.8	0.9	0.9	0.8	8.0	9.3	11.1	4.4	5.4
Pegatron	4938 TT	ODM	7,082	82.5	Neutral	84.0	6.14	7.00	8.16	8.4	14.1	16.5	13.4	11.8	10.1	1.2	1.1	1.1	8.8	9.8	11.0	4.8	5.5
Compal*	2324 TT	ODM	5,126	36.1	Not rated	N.A.	1.90	2.53	2.83	13.5	33.7	11.5	19.1	14.3	12.8	1.3	1.2	1.2	6.8	8.9	9.6	3.7	5.0
Chicony Elec	2385 TT	Keyboard	4,481	183.0	Outperform	152.0	10.35	11.69	12.61	0.8	13.0	7.9	17.7	15.7	14.5	3.5	3.2	3.0	20.1	21.1	21.0	4.0	4.5
Primax	4915 TT	Keyboard	970	65.0	Neutral	72.0	5.61	6.53	7.43	(8.1)	16.3	13.8	11.6	10.0	8.8	1.7	1.6	1.5	15.1	16.6	17.9	5.7	6.6
SZS	3376 TT	Hinge	744	123.0	Neutral	97.0	4.94	6.45	7.76	(43.1)	30.6	20.3	24.9	19.1	15.9	1.4	1.4	1.4	5.8	7.4	8.8	3.0	3.9
Delta Elec	2308 TT	Power	24,521	293.0	Neutral	297.0	12.84	13.10	15.16	2.1	2.0	15.7	22.8	22.4	19.3	3.9	3.6	3.3	17.5	16.8	17.8	2.4	2.4
Lite-On Tech	2301 TT	Power	8,226	108.5	Outperform	134.0	6.75	6.75	9.04	9.0	9.0	14.4	16.1	15.8	13.5	2.8	2.8	2.6	18.2	18.2	21.3	4.2	4.7
Sunonwealth	2421 TT	Thermal	891	101.5	Outperform	130.0	5.78	7.08	8.24	33.2	22.6	16.3	17.6	14.3	12.3	4.5	4.1	3.8	26.8	30.2	32.1	4.0	5.0
Auras	3324 TT	Thermal	944	331.5	Outperform	445.0	15.86	21.09	26.47	8.0	33.0	25.5	20.9	15.7	12.5	6.2	4.0	3.4	23.0	26.6	28.6	2.1	2.7
Simplo Tech	6121 TT	Battery	2,411	404.5	Outperform	420.0	29.13	34.97	41.04	(25.5)	20.1	17.4	13.9	11.6	9.9	2.2	2.1	1.9	15.9	18.2	20.3	5.3	6.3
Lotes	3533 TT	Connector/ socket	3,490	973.0	Outperform	1,075.0	53.78	63.90	79.82	(8.4)	18.8	24.9	18.1	15.2	12.2	4.0	3.5	3.1	24.4	25.8	28.2	2.9	3.4
Alltop Tech	3526 TT	Connector	352	185.0	Outperform	215.0	11.32	12.91	14.13	20.2	14.1	9.5	16.3	14.3	13.1	4.1	3.9	3.7	25.9	28.1	29.2	5.0	5.7
Gold Circuit	2368 TT	PCB	3,264	206.0	Outperform	275.0	7.65	13.42	17.01	(13.7)	75.5	26.7	26.9	15.3	12.1	6.6	5.4	4.3	25.3	38.7	39.5	1.5	2.6
Compeq Mfg	2313 TT	PCB	2,584	67.3	Outperform	100.0	3.84	6.40	7.94	(42.8)	66.6	24.0	17.5	10.5	8.5	1.9	1.7	1.5	11.4	17.4	19.3	2.2	3.9
Elite Material	2383 TT	CCL	4,138	376.0	Outperform	550.0	16.88	23.07	27.00	10.8	36.7	17.0	22.3	16.3	13.9	5.1	4.5	3.9	24.1	29.3	30.0	2.5	3.5
Kinsus	3189 TT	Substrate	1,409	96.2	Neutral	90.0	(0.06)	5.13	8.59	N.M.	N.M.	67.5	N.M.	18.8	11.2	1.3	1.2	1.1	(0.1)	6.7	10.6	0.0	2.6
Unimicron Tech	3037 TT	Substrate	7,887	160.5	Outperform	185.0	7.45	9.28	15.43	(62.9)	24.5	66.2	21.5	17.3	10.4	2.6	2.4	2.1	12.7	14.6	21.8	1.9	2.3
Zhen Ding Tech	4958 TT	FPCB	3,173	104.0	Neutral	99.0	6.77	9.91	N.A.	(55.0)	46.5	N.A.	15.4	10.5	N.A.	1.0	0.9	N.A.	6.5	9.1	N.A.	3.3	4.8
Flexium Intercon	6269 TT	FPCB	907	87.3	Neutral	82.0	6.94	8.23	N.A.	(35.9)	18.5	N.A.	12.6	10.6	N.A.	1.1	1.0	N.A.	8.7	9.6	N.A.	4.0	4.6
Catcher Tech	2474 TT	Casing	4,340	198.0	Neutral	190.0	17.81	12.69	11.08	17.7	(28.8)	(12.7)	11.1	15.6	17.9	0.7	0.6	0.5	6.8	4.1	3.0	5.1	5.1
Foxconn Tech*	2354 TT	Casing	2,338	51.3	Not rated	N.A.	4.34	5.41	5.71	43.7	24.7	5.5	11.8	9.5	9.0	0.5	0.4	0.4	5.8	7.0	7.1	2.9	4.2

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

Figure 23: Global PC shipments by brand

Vendor	PC (incl. Chromebook) shipments (mn units)																			
	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	3Q22	4Q22	1Q23	2Q23	3Q23	2018	2019	2020	2021	2022	1-3Q23
Lenovo	13.1	18.2	20.2	23.6	20.9	20.4	20.2	21.9	18.4	17.6	17.3	15.7	13.0	14.3	16.2	59.9	65.6	75.1	83.4	69.0	43.5
HP Inc.	11.8	18.2	18.7	19.5	19.3	18.6	17.6	18.6	15.9	13.4	12.8	13.2	11.9	13.5	13.5	60.7	62.8	68.2	74.2	55.4	38.9
Dell	10.6	12.2	12.0	15.9	13.0	14.0	15.2	17.3	13.8	12.7	12.6	10.9	9.5	10.4	10.3	44.3	46.7	50.7	59.6	50.0	30.3
Apple	3.8	5.1	6.7	6.4	6.4	5.8	6.9	7.8	7.3	5.3	8.3	5.9	5.2	5.1	5.8	18.5	18.3	22.0	26.9	26.8	16.1
Acer Group	3.7	5.6	6.3	6.8	5.9	6.3	6.0	6.1	5.5	4.8	4.8	3.6	3.5	4.0	4.4	19.8	18.4	22.5	24.3	18.7	11.9
Asus	2.9	3.9	5.7	5.4	4.6	4.9	6.0	6.1	5.6	4.6	5.6	4.9	3.8	3.9	5.0	15.9	15.2	17.9	21.6	20.7	12.7
Microsoft	1.2	1.7	1.7	1.8	1.4	1.3	1.2	2.0	1.4	1.4	1.3	1.3	1.1	1.2	1.0	5.1	5.5	6.4	5.9	5.4	3.3
Sharp	0.3	0.4	0.4	0.7	0.5	0.5	0.5	0.5	0.5	0.3	0.4	0.3	0.4	0.3	0.3	0.3	1.7	1.9	2.0	1.7	1.0
MSI	0.3	0.5	0.7	0.7	0.6	0.6	0.8	0.9	0.9	0.6	0.7	0.6	0.6	0.7	0.7	1.4	1.4	2.2	3.0	2.8	2.0
Samsung	1.0	1.1	0.9	1.1	1.2	1.1	1.0	1.0	1.0	1.0	1.0	0.9	0.8	0.7	0.6	2.2	3.8	4.0	4.2	3.9	2.1
Others	7.5	9.1	10.5	10.2	9.7	8.9	9.0	9.0	8.4	9.6	5.8	5.8	5.4	5.5	5.9	46.6	38.9	37.2	36.7	29.6	16.8
Top-10	48.7	66.9	73.4	81.9	73.8	73.5	75.4	82.2	70.4	61.9	64.8	57.4	49.9	54.1	57.8	228.1	239.6	271.0	305.1	254.4	161.7
Total	56.2	76.0	83.9	92.1	83.5	82.4	84.4	91.3	78.8	71.5	70.6	63.2	55.3	59.5	63.7	274.7	278.5	308.2	341.7	284.0	178.5
	YoY (%)																				
Lenovo	(3.2)	11.8	14.8	29.8	59.4	12.0	0.3	(7.2)	(12.0)	(13.8)	(14.2)	(28.4)	(29.2)	(18.6)	(6.8)	7.4	9.5	14.5	11.1	(17.3)	(18.4)
HP Inc.	(13.1)	18.0	12.8	13.0	63.6	2.2	(5.9)	(4.2)	(17.8)	(27.8)	(27.1)	(29.1)	(24.7)	0.1	5.4	2.4	3.5	8.5	8.8	(25.4)	(7.6)
Dell	1.6	4.6	(1.1)	27.5	23.0	15.3	26.4	8.4	6.1	(9.4)	(17.3)	(37.0)	(30.9)	(18.3)	(18.1)	5.6	5.4	8.6	17.4	(16.0)	(22.7)
Apple	(1.1)	22.3	30.8	22.8	71.9	14.5	2.1	21.1	13.6	(8.8)	20.4	(24.1)	(28.4)	(3.2)	(30.4)	(2.3)	(1.0)	20.0	22.4	(0.4)	(22.8)
Acer Group	(5.7)	27.0	22.2	40.3	56.2	12.0	(4.6)	(10.2)	(5.5)	(22.9)	(21.2)	(41.2)	(36.3)	(17.4)	(7.8)	(3.6)	(7.0)	22.1	8.0	(22.9)	(21.3)
Asus	(22.0)	24.6	38.4	25.4	62.2	25.2	5.0	13.4	20.3	(6.6)	(6.5)	(20.0)	(31.7)	(15.5)	(11.6)	(13.0)	(4.5)	17.3	21.1	(4.5)	(19.8)
Microsoft	0.5	28.4	37.6	4.2	14.7	(24.5)	(26.6)	6.5	2.2	10.5	5.9	(35.6)	(24.2)	(17.8)	(21.4)	21.2	8.3	16.6	(8.8)	(7.9)	(21.1)
Sharp	(23.3)	26.4	(10.6)	51.3	53.6	5.7	8.9	(28.5)	4.1	(26.6)	(6.1)	(33.5)	(33.1)	(9.4)	(24.7)	N.M.	527.5	10.5	2.0	(15.5)	(24.2)
MSI	8.0	70.5	55.3	90.0	88.5	24.5	14.4	36.8	53.7	(0.9)	(16.8)	(33.0)	(38.9)	14.8	4.2	(4.5)	0.9	57.5	34.6	(4.2)	(10.9)
Samsung	(15.6)	21.4	2.0	21.2	25.3	0.2	4.3	(8.2)	(17.0)	(8.0)	2.8	(4.2)	(23.2)	(30.3)	(35.7)	(11.6)	73.9	5.5	5.0	(7.2)	(29.7)
Others	(24.2)	(11.2)	11.6	8.3	28.5	(1.8)	(13.8)	(10.9)	(13.4)	8.0	(36.0)	(35.8)	(35.1)	(43.2)	1.8	(11.3)	(16.5)	(4.3)	(1.5)	(19.3)	(29.4)
Top-10	(6.5)	15.5	15.0	24.6	51.8	9.8	2.7	0.4	(4.7)	(15.9)	(14.1)	(30.2)	(29.2)	(12.6)	(10.8)	2.3	5.0	13.1	12.6	(16.6)	(17.9)
Total	(9.3)	11.5	14.6	22.5	48.7	8.5	0.7	(0.9)	(5.7)	(13.3)	(16.4)	(30.8)	(29.8)	(16.7)	(9.8)	(0.3)	1.4	10.7	10.9	(16.9)	(19.2)
	QoQ (%)																				
Lenovo	(28.0)	39.1	10.6	17.2	(11.6)	(2.2)	(1.0)	8.5	(16.2)	(4.2)	(1.5)	(9.4)	(17.2)	10.2	12.9						
HP Inc.	(31.5)	54.5	2.8	3.9	(0.8)	(3.5)	(5.3)	5.8	(14.9)	(15.3)	(4.5)	3.0	(9.6)	12.7	0.5						
Dell	(15.4)	15.1	(1.0)	32.3	(18.4)	7.9	8.5	13.4	(20.1)	(7.9)	(0.9)	(13.6)	(12.3)	8.9	(0.7)						
Apple	(28.6)	35.6	32.2	(4.1)	0.0	(9.7)	17.9	13.7	(6.2)	(27.5)	55.7	(28.3)	(11.5)	(2.0)	11.9						
Acer Group	(22.7)	49.3	13.2	7.4	(14.0)	7.1	(3.6)	1.1	(9.4)	(12.7)	(1.5)	(24.6)	(1.8)	13.2	10.0						
Asus	(33.1)	37.0	45.9	(6.3)	(13.4)	5.8	22.4	1.2	(8.1)	(17.9)	22.6	(13.4)	(21.5)	1.5	28.2						
Microsoft	(32.5)	42.5	(2.3)	11.0	(25.7)	(6.3)	(4.9)	60.9	(28.7)	1.4	(8.9)	(2.1)	(16.1)	9.9	(12.9)						
Sharp	(29.2)	30.1	(3.3)	69.8	(28.1)	(10.5)	(0.3)	11.5	4.7	(36.9)	27.5	(21.0)	5.2	(14.5)	5.9						
MSI	(11.4)	57.8	35.6	0.2	(12.1)	4.2	24.6	19.9	(1.3)	(32.8)	4.6	(3.5)	(9.9)	26.3	(5.1)						
Samsung	11.7	10.0	(12.4)	12.7	15.5	(12.0)	(8.8)	(0.9)	4.5	(2.6)	1.9	(7.6)	(16.3)	(11.5)	(6.1)						
Others	(19.7)	20.6	15.1	(2.9)	(4.7)	(7.8)	1.1	0.4	(7.4)	15.0	(40.1)	0.6	(6.3)	0.6	7.3						
Top-10	(26.0)	37.6	9.7	11.6	(9.9)	(0.4)	2.6	9.0	(14.4)	(12.1)	4.8	(11.5)	(13.1)	8.5	6.9						
Total	(25.2)	35.3	10.3	9.8	(9.3)	(1.3)	2.4	8.1	(13.7)	(9.2)	(1.3)	(10.5)	(12.5)	7.7	6.9						
	Global market share (%)																				
Lenovo	23.3	24.0	24.0	25.6	25.0	24.8	23.9	24.0	23.3	24.6	24.6	24.9	23.5	24.1	25.4	21.8	23.6	24.4	24.4	24.3	24.4
HP Inc.	21.0	24.0	22.3	21.1	23.1	22.6	20.9	20.4	20.1	18.8	18.2	20.9	21.6	22.6	21.2	22.1	22.6	22.1	21.7	19.5	21.8
Dell	18.8	16.0	14.4	17.3	15.6	17.0	18.0	18.9	17.5	17.8	17.9	17.2	17.3	17.5	16.2	16.1	16.8	16.5	17.4	17.6	16.9
Apple	6.7	6.7	8.0	7.0	7.7	7.1	8.1	8.6	9.3	7.4	11.7	9.4	9.5	8.6	9.0	6.7	6.6	7.1	7.9	9.4	9.0
Acer Group	6.7	7.4	7.5	7.4	7.0	7.6	7.1	6.7	7.0	6.8	6.7	5.7	6.4	6.7	6.9	7.2	6.6	7.3	7.1	6.6	6.7
Asus	5.1	5.2	6.8	5.8	5.6	6.0	7.1	6.7	7.1	6.4	8.0	7.7	6.9	6.5	7.8	5.8	5.5	5.8	6.3	7.3	7.1
Microsoft	2.1	2.2	2.0	2.0	1.6	1.6	1.4	2.2	1.8	2.0	1.8	2.0	1.9	2.0	1.6	1.9	2.0	2.1	1.7	1.9	1.8
Sharp	0.6	0.6	0.5	0.8	0.6	0.6	0.5	0.6	0.7	0.5	0.6	0.5	0.7	0.5	0.5	0.1	0.6	0.6	0.6	0.6	0.6
MSI	0.6	0.7	0.8	0.7	0.7	0.8	0.9	1.0	1.2	0.9	0.9	1.0	1.0	1.2	1.1	0.5	0.5	0.7	0.9	1.0	1.1
Samsung	1.7	1.4	1.1	1.1	1.5	1.3	1.2	1.1	1.3	1.4	1.4	1.5	1.4	1.2	1.0	0.8	1.4	1.3	1.2	1.4	1.2
Other	13.4	11.9	12.5	11.0	11.6	10.8	10.7	9.9	10.6	13.5	8.2	9.2	9.8	9.2	9.2	17.0	14.0	12.1	10.7	10.4	9.4
Top-10	86.6	88.1	87.5	89.0	88.4	89.2	89.3	90.1	89.4	86.5	91.8	90.8	90.2	90.8	90.8	83.0	86.0	87.9	89.3	89.6	90.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Gartner, KGI Research

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