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AP Memory
2021 Q4 Investor Conference

2022 Mar 1st

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Agenda

1 **2021 Q4 Financial Highlight**

2 **Business Overview**

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3 **Future Outlook**

4 **Q&A**

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2021 Q4 Financial Highlight

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Consolidated Income Statement

(in NT$K)	4Q21		3Q21		4Q20		QoQ	YoY
Net Revenue	1,737,500	100%	2,019,004	100%	1,011,990	100%	(14%)	72%
Gross Margin	793,249	46%	939,142	47%	399,603	39%	(16%)	99%
Operating expenses	(169,196)	(10%)	(185,136)	(10%)	(145,704)	(14%)	(9%)	16%
Operating Margin	624,053	36%	754,006	37%	253,899	25%	(17%)	146%
Non-operating income and expenses	49,381	3%	87,160	5%	424,049*	42%	(43%)	(88%)
Profit before income tax	673,434	39%	841,166	42%	677,948	67%	(20%)	(1%)
Income tax expense	(130,517)	(8%)	(165,253)	(9%)	(109,685)	(11%)	(21%)	19%
Net income	542,917	31%	675,913	33%	577,627	57%	(20%)	(6%)
Basic Earnings per share(NT$)**	$3.66		$4.56		$3.90			

*Includes one time gain from disposal of subsidiary NT$428 million.
** Retroactively adjusted by the effect of the stock split.

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Consolidated Income Statement

(in NT$K)	2021		2020		YoY
Net Revenue	6,617,215	100%	3,549,497	100%	86%
Gross Margin	3,025,608	46%	1,025,671	29%	195%
Operating expenses	(655,451)	(10%)	(505,925)	(14%)	30%
Operating Margin	2,370,157	36%	519,746	15%	356%
Non-operating income and expenses	144,109	2%	420,609	12%	(66%)
Profit before income tax	2,514,266	38%	940,355	27%	167%
Income tax expense	(488,809)	(7%)	(124,985)	(4%)	291%
Net income	2,025,457	31%	820,983	23%	147%
Basic Earnings per share(NT$)**	$13.67		$5.50		

*4Q20 non-operating income includes one time gain from disposal of subsidiary NT$428 million.
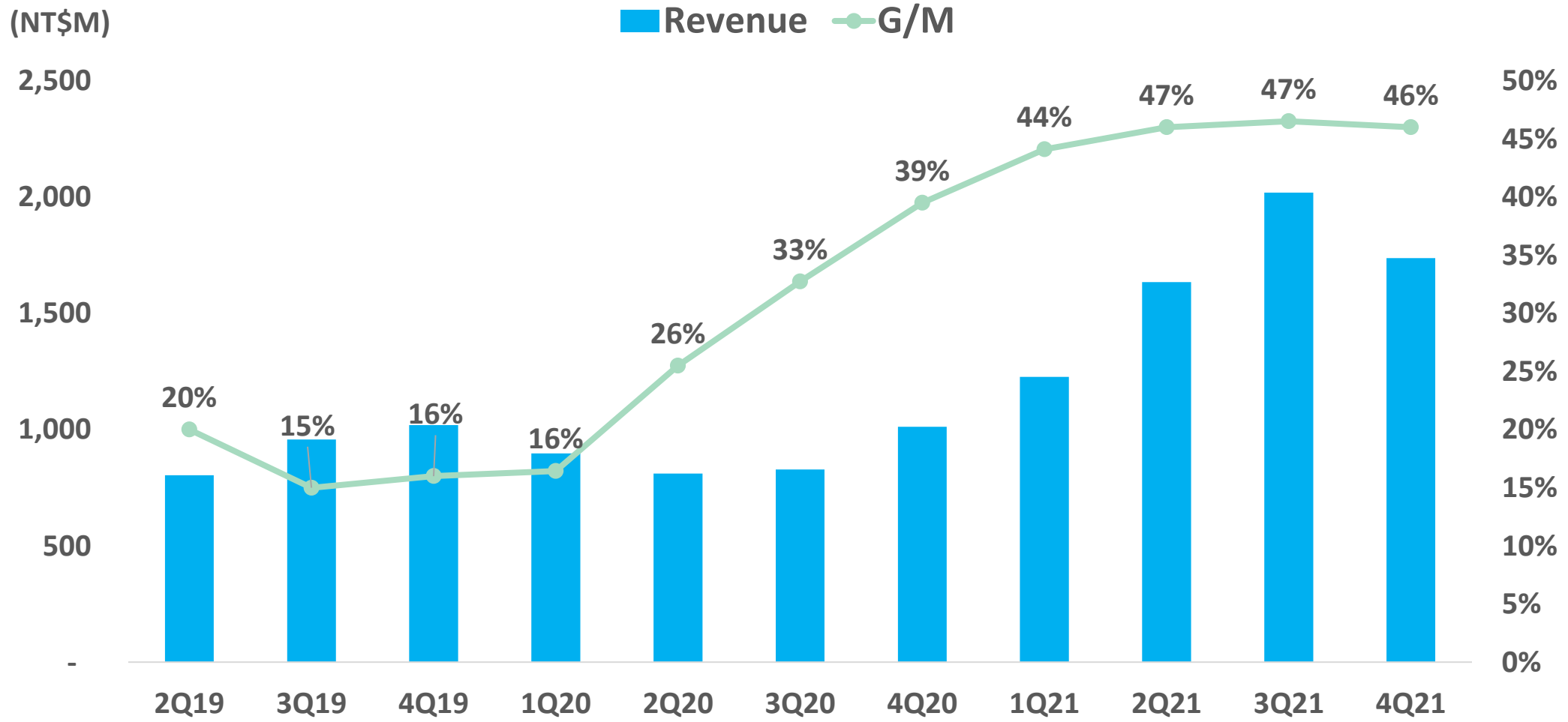**Retroactively adjusted by the effect of the stock split.

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Balance Sheet

(in NT$K)	2021.12.31		2021.09.30		2021.06.30	
	AMT	%	AMT	%	AMT	%
Cash and Cash Equivalents	2,517,447	40%	2,446,151	44%	1,478,362	28%
Account Receivables	854,080	14%	745,081	13%	779,104	15%
Inventories	1,696,621	27%	1,352,127	24%	976,651	19%
Total Assets	6,278,643	100%	5,609,237	100%	5,250,279	100%
Liabilities	1,483,688	24%	1,370,823	25%	1,694,991	32%
Shareholders' Equity	4,794,955	76%	4,238,414	75%	3,555,288	68%
Net Worth Per Share(NT$)	32.2		28.5**		23.9**	

**Retroactively adjusted by the effect of the stock split.

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Revenue & Gross Margin

Operating Profit & Net Income

(NT$M)

	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21
Operating Profit	44	76	147	254	393	599	754	624
%Margin	4.8%	9.3%	17.7%	25.1%	32.1%	36.6%	37.3%	36.0%

(NT$M)

Significant growth in 4Q20 net income mainly due to increase in non-operating income from disposal of subsidiary, Zentel Japan

	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21
Net income	49	75	123	140 / 428	350	456	676	543
%Margin	5.5%	9.3%	14.8%	56.2%	28.6%	27.9%	33.5%	31.2%

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GDR

- Issue Date：2022/01/25

- The GDR Offering : 6,400,000 GDRs representing 12,800,000 new common shares

- Equity Dilution Ratio : 7.9%

- Offering Price：USD 29.65 per GDR (NT$410 per common share)

- Fund raised：USD 189,760,000

- Use of proceeds：

  - Purchase of machinery equipment

  - Investments in the resources of research and development

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Business Overview

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Business Overview

APM IoT Solutions | APM AI Solutions

Business model

APM IoT Solutions
- Sales of IoT RAM
  - Mostly Known-Good-Die (KGD)
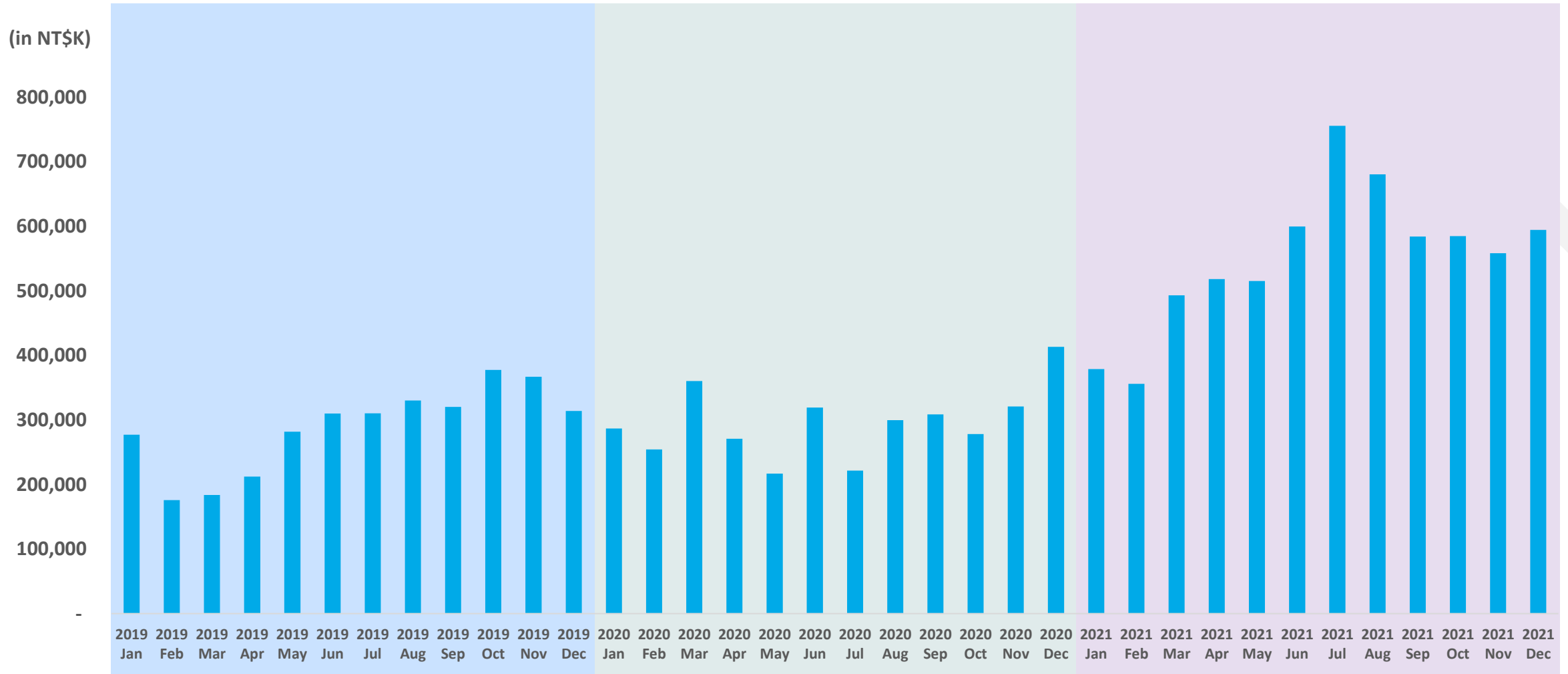 - Wafer-Level-Chip-Scale Package (WLCSP)

APM AI Solutions
- Licensing, royalty-like DRAM wafer sales for 3DIC
  - Pre-production: License fee of VHM™ and VHM™ LInK IP
  - Production: sales of VHM™ wafers

Market position

APM IoT Solutions
- **Dominant** market share in global IoT PSRAM market

APM AI Solutions
- Create an entirely **New Market** and **Ecosystem**

Key product lines

APM IoT Solutions
- PSRAM and low-power DRAM, IPD
- Wearables, Smart IoT, AIoT applications

APM AI Solutions
- VHM™ DRAM and IP
- AI and HPC applications

Highlights

APM IoT Solutions
- Shipping ~1 billion units yearly
- Non-cyclical, stable profit margin
- Market leader
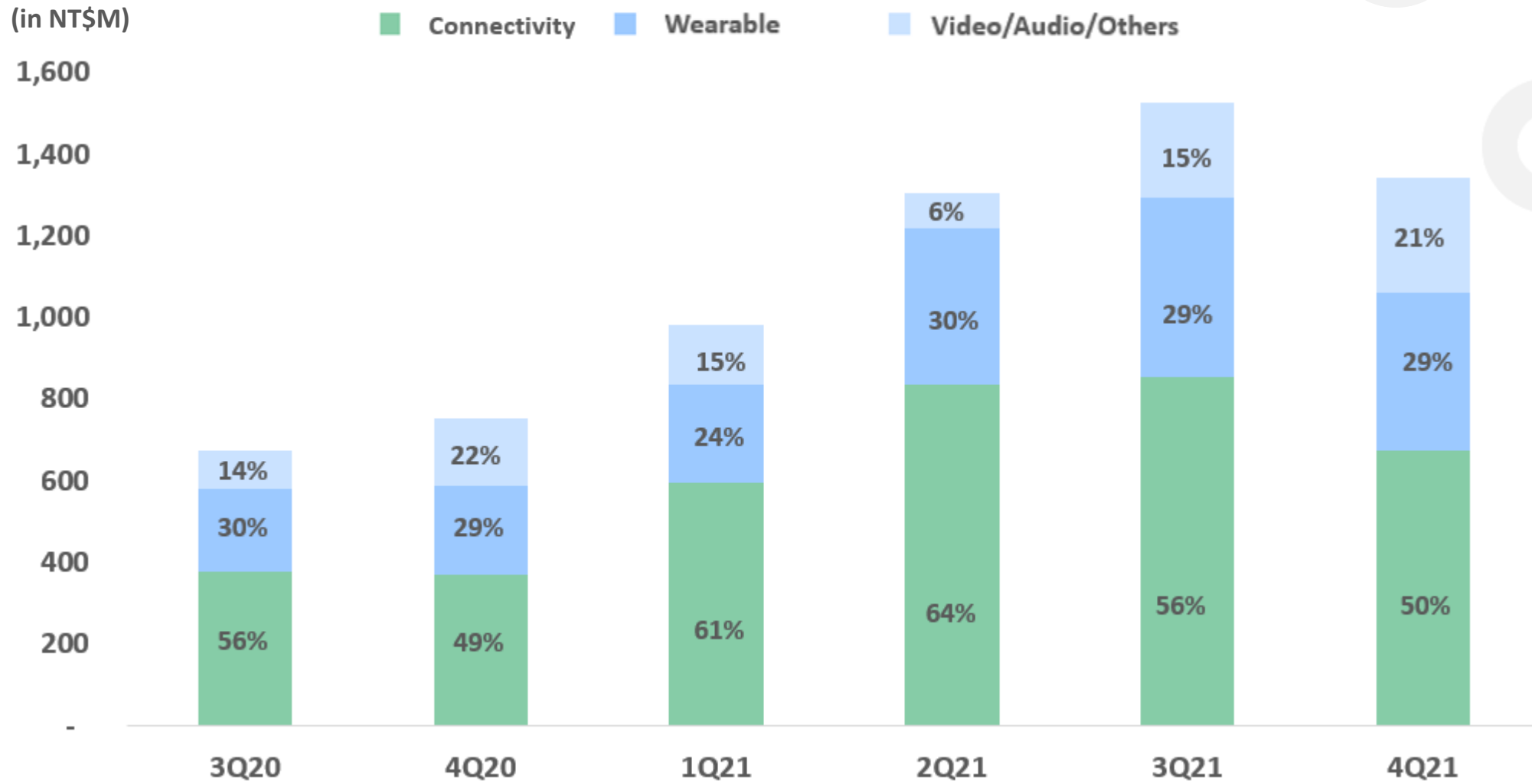
APM AI Solutions
- VHM™ - world's first 3D integration of DRAM and logic chips
- Far ahead of competitors
- Gradually adopted by mainstream applications

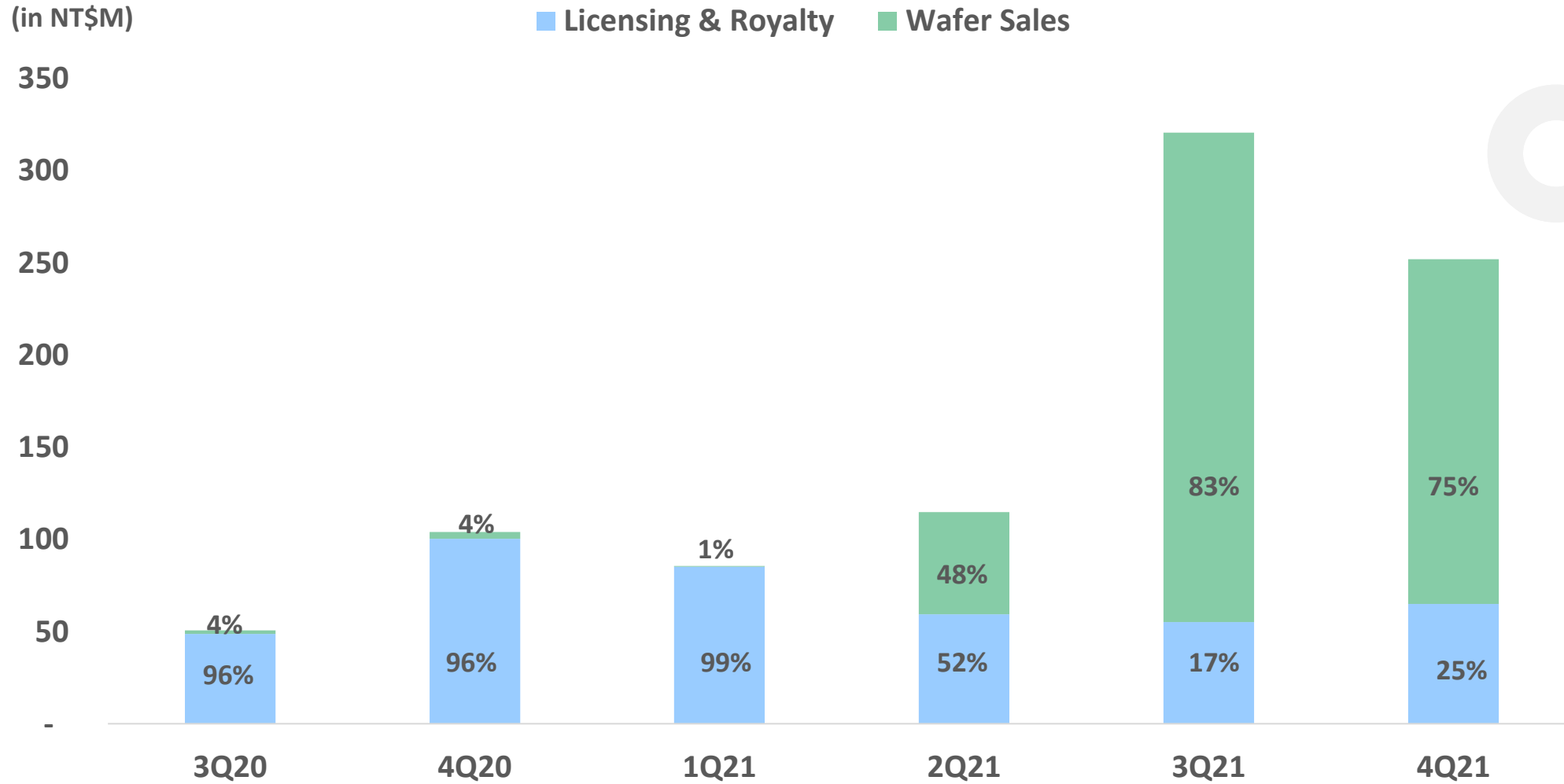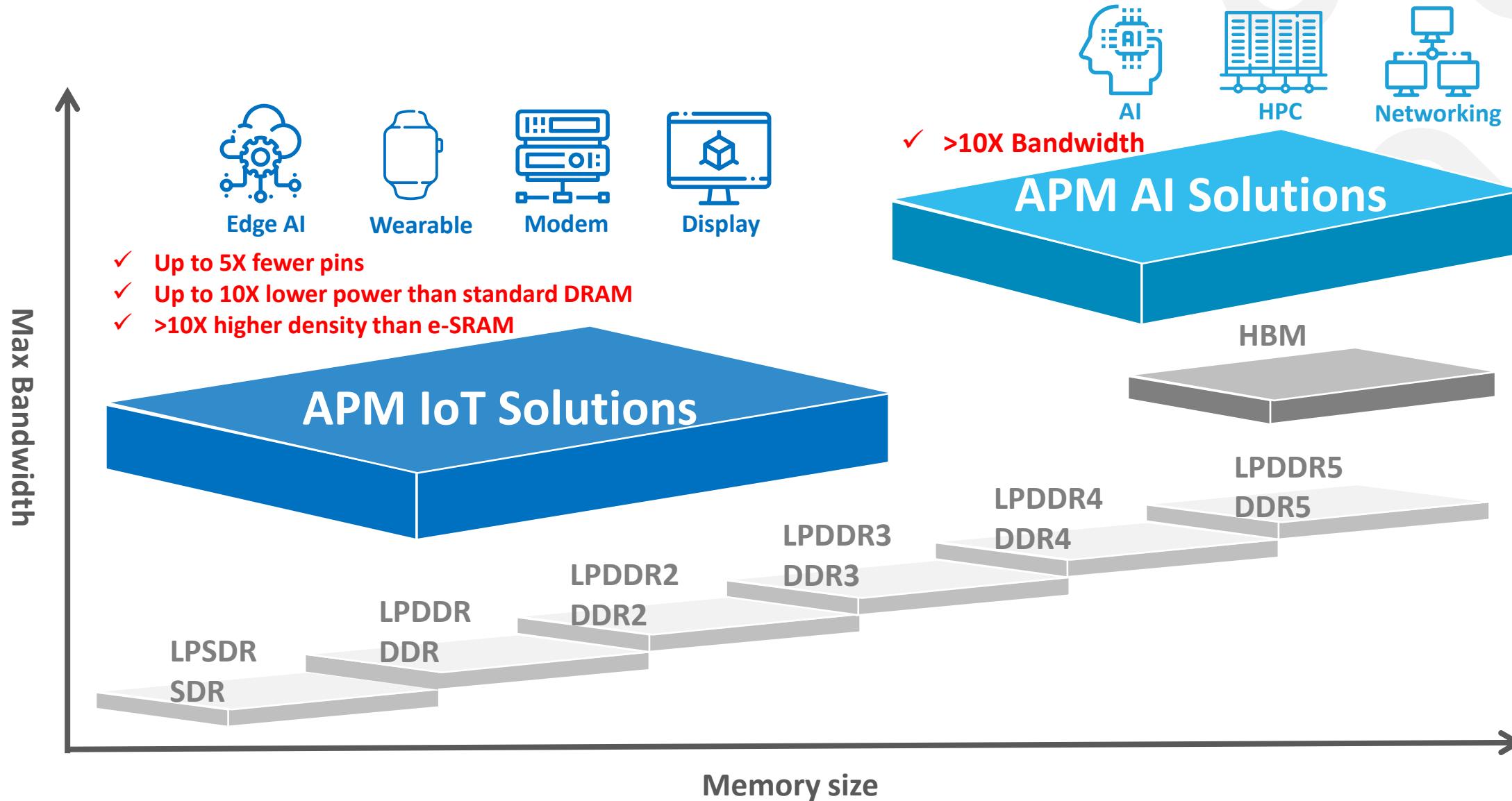apmemory

Monthly Revenue Trend

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IoT Revenue by category

(in NT$M)

Legend: Connectivity | Wearable | Video/Audio/Others

Quarter	Connectivity	Wearable	Video/Audio/Others
3Q20	56%	30%	14%
4Q20	49%	29%	22%
1Q21	61%	24%	15%
2Q21	64%	30%	6%
3Q21	56%	29%	15%
4Q21	50%	29%	21%

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AI Revenue by category

(in NT$M)

■ Licensing & Royalty ■ Wafer Sales

	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21
Wafer Sales	4%	4%	1%	48%	83%	75%
Licensing & Royalty	96%	96%	99%	52%	17%	25%

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Future Outlook

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Positioning of APM Solutions

AI **HPC** **Networking**

Edge AI **Wearable** **Modem** **Display**

✓ **>10X Bandwidth**

APM AI Solutions

✓ **Up to 5X fewer pins**
✓ **Up to 10X lower power than standard DRAM**
✓ **>10X higher density than e-SRAM**

HBM

APM IoT Solutions

LPDDR5
DDR5

LPDDR4
DDR4

LPDDR3
DDR3

LPDDR2
DDR2

LPDDR
DDR

LPSDR
SDR

Max Bandwidth

Memory size

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VHM^{TM}: World's first 3D Logic-DRAM integration

✓ **2.5D**

SoC

HBMx

1K

Interposer

mm

✓ **3D**

VHM^{TM}
>100K

um

SoC

VHM^{TM} DRAM (Array)

macro macro macro macro
macro macro macro macro
macro macro macro macro
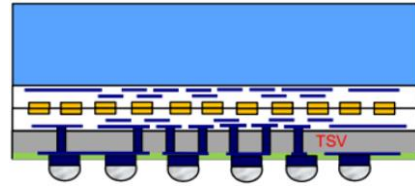macro macro macro macro

SoC (incl VHM^{TM} LInk)
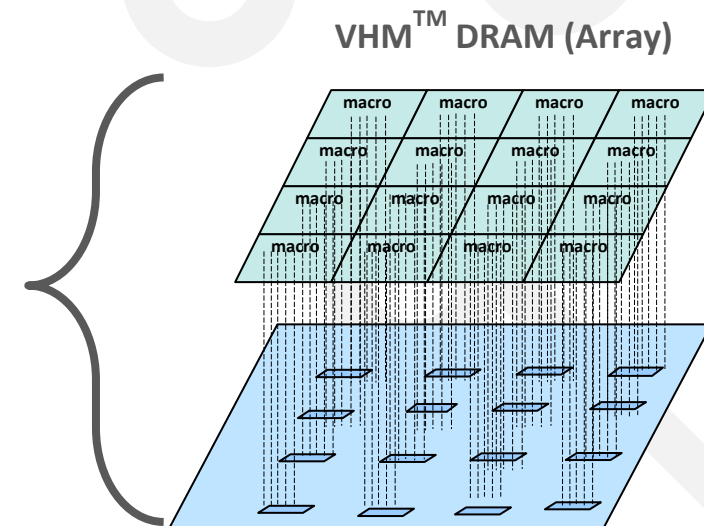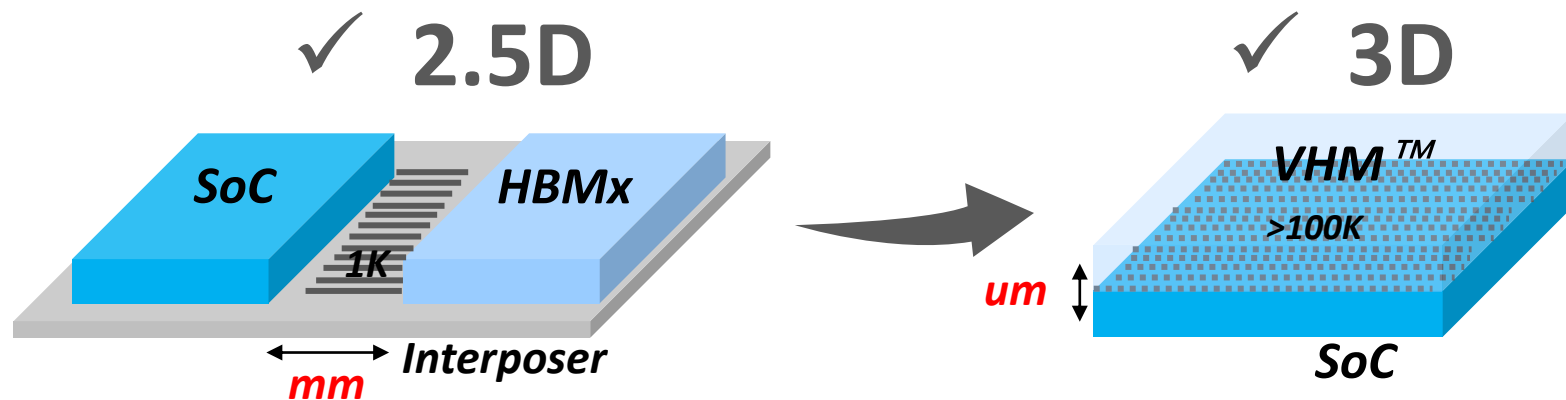
VHM^{TM}: Very High-bandwidth Memory

- ✓ 3D stacking of DRAM and logic chips
- ✓ >10x memory bandwidth than traditional HBM technology
- ✓ Vertical connections enabling bandwidth far beyond 2.5D technologies
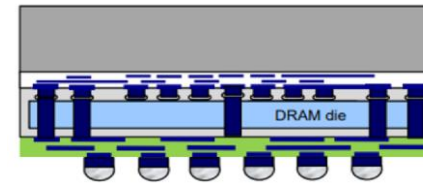- ✓ 5-10x the max on-die RAM capacity of 7nm technology

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■ 2.5D
■ 3D

Bump Density | Speed | Bandwidth Density | Power Efficiency(Energy/bit)

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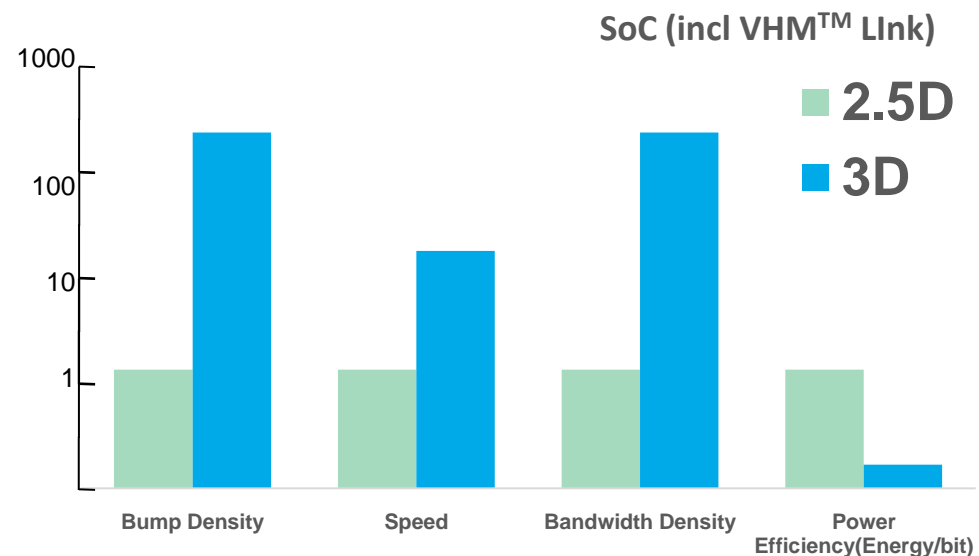
APM 3DIC Landscape

✔ WoW Hybrid Bonding   ✔ CoW uBump Bonding

	WoW Hybrid Bonding	CoW uBump Bonding
Stacking partner	Front End (Wafer Foundry)	Back End (OSAT)
pitch	Pitch < 3um >>100K IO	Pitch ~ 40um 1-2K IO
Base technology	BSI CIS	HBM
Application	HPC Mining Networking	CPU/GPU AI AR/VR

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VHM™ Technological Superiority

	Interface width (pin)	Data Rate (Gb/s/pin)	Bandwidth (GB/s)	Power Efficiency (pJ/bit)
VHM™	~200k	0.5	12000	<1
HBM2E (per stack)	1024	3.2	410	~6
GDDR6	32	16	64	~7.5
LPDDR5	32	6.4	25.6	~5.5

Source: Micron, APMemory
*Based on one successful chip

	Core Tech	Memory	Hash/s	Power
VHM™	55nm	36Gb Customized DRAM	280M	150W
A	7nm	16GB HBM2	90M	300W
N	16nm	8GB DDR5	30M	150W

Source: PSMC

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VHM™ Production Flow

VHM™ DRAM Wafer
(Provide by APM)

+

SoC Wafer
(Provide by Customer)

WoW Hybrid Bonding

Logic Die

DRAM Die
Si substrate(DRAM)

IST 10.0kV 7.6mm x3.00k SE(U)   10.0µm

Hybrid Bonding
By stacking process

Die Saw

Package assembly

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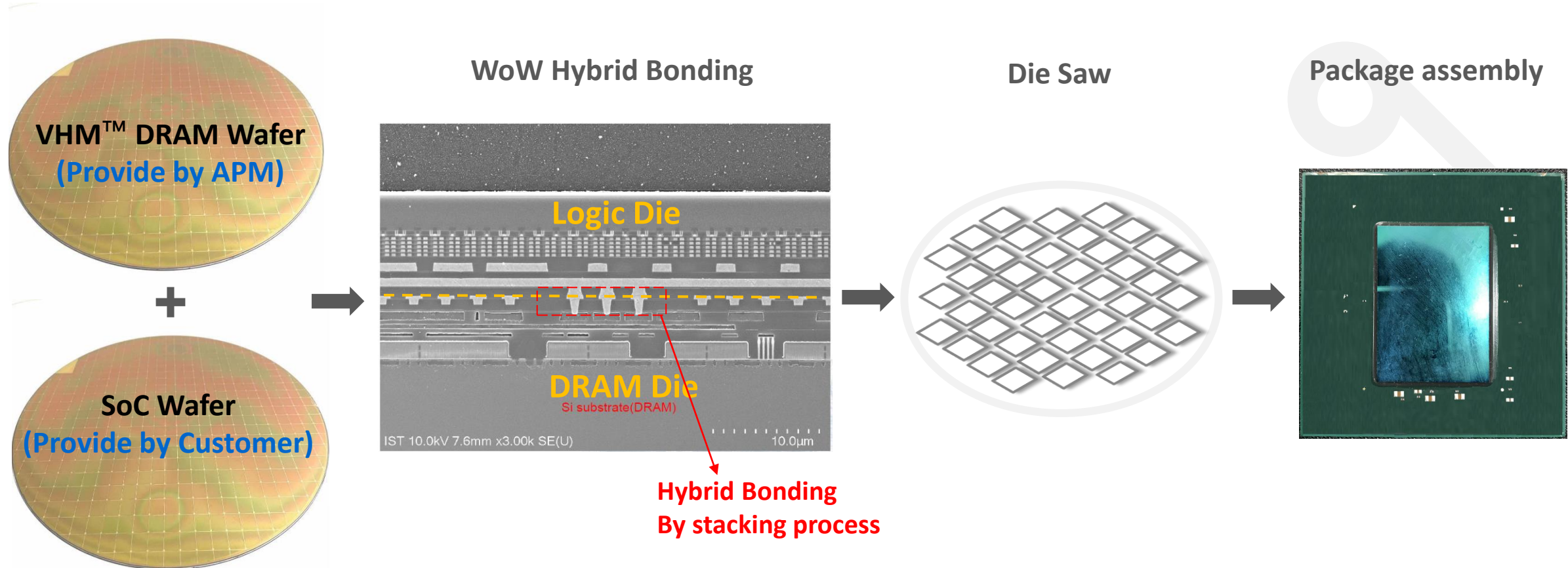
APM Si-Cap Opportunity

Capacitor trend:

- ✅ Moving closer to compute die
- ✅ Smaller in size
- ✅ Denser in capacity

Capacitor chiplet on die

IPD Capacitor on land side

Capacitor on Package

Capacitor on PCB

Compute SOC

Package Substrate

PCB
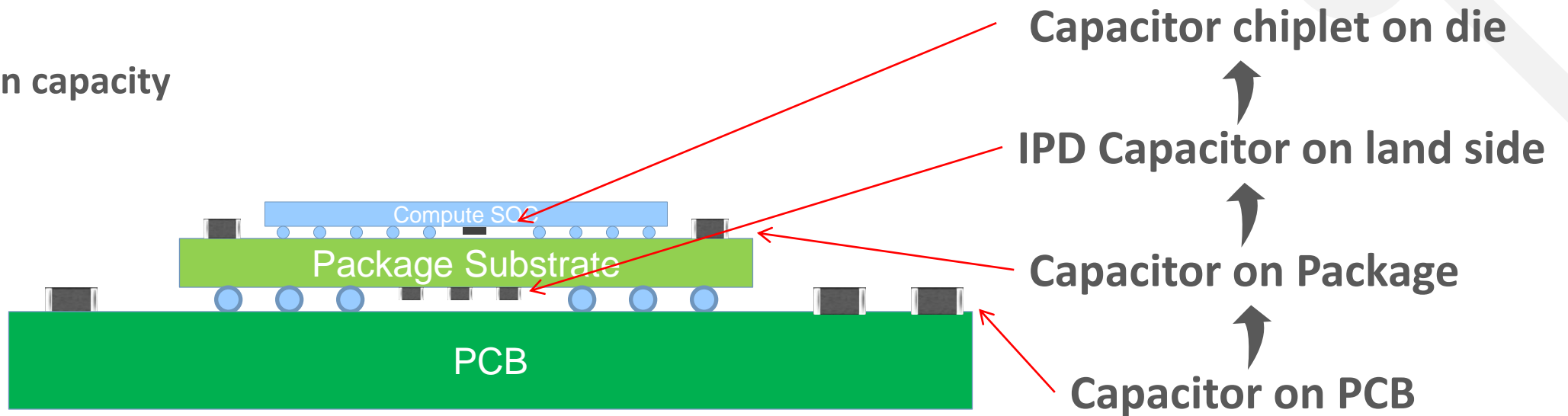
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Future Outlook

	APM IoT Solutions	**APM AI Solutions**
Core Focus	• Revenue/profit growth	• 3D ecosystem development: WoW, CoW
Long-term Outlook	• Growing cash cow, riding long-term IoT growth	• Vast opportunities, execution is the key

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Q&A

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