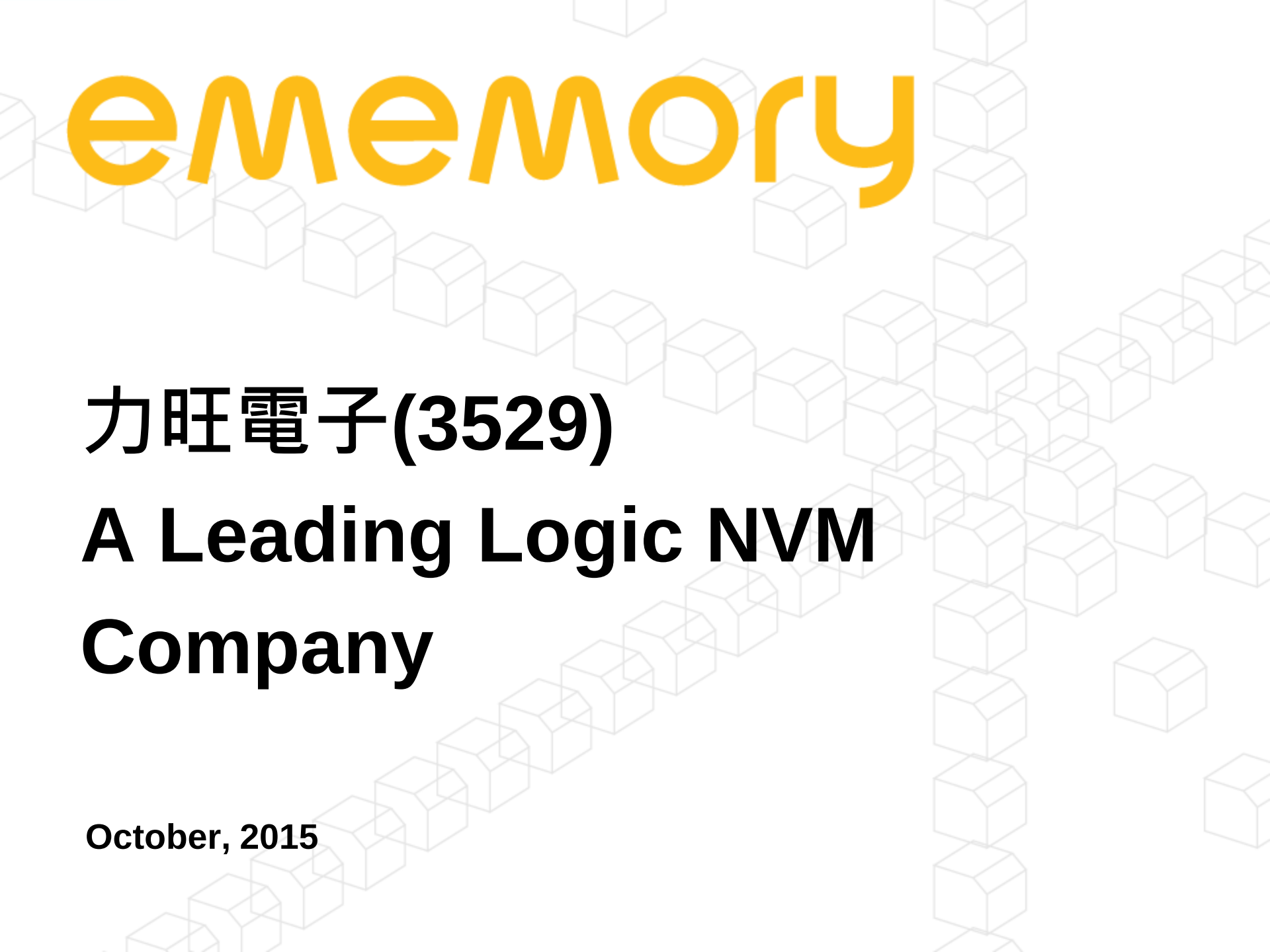


The background of the slide is filled with a pattern of white, 3D-outlined cubes. These cubes are arranged in a way that creates a sense of depth and movement, with some cubes appearing to be in the foreground and others receding into the background. The cubes are scattered across the entire slide, providing a modern, geometric aesthetic.

ememory

力旺電子(3529)

**A Leading Logic NVM
Company**

October, 2015

智慧財產權聲明

本文件內之資訊，包括文字、圖片、圖表、表格或其他檔案等，其所有權利或利益，包括但不限於所有權及智慧財產權，皆屬力旺電子所有，請尊重智慧財產權。本文件之內容包含力旺電子之機密資訊。部分內容可參見2014年出版之Logic Non-Volatile Memory (The NVM solutions from eMemory)一書。任何在此之資訊在未經力旺電子書面同意，不得影印、散佈、複製、使用本文件或將其揭露予第三人。

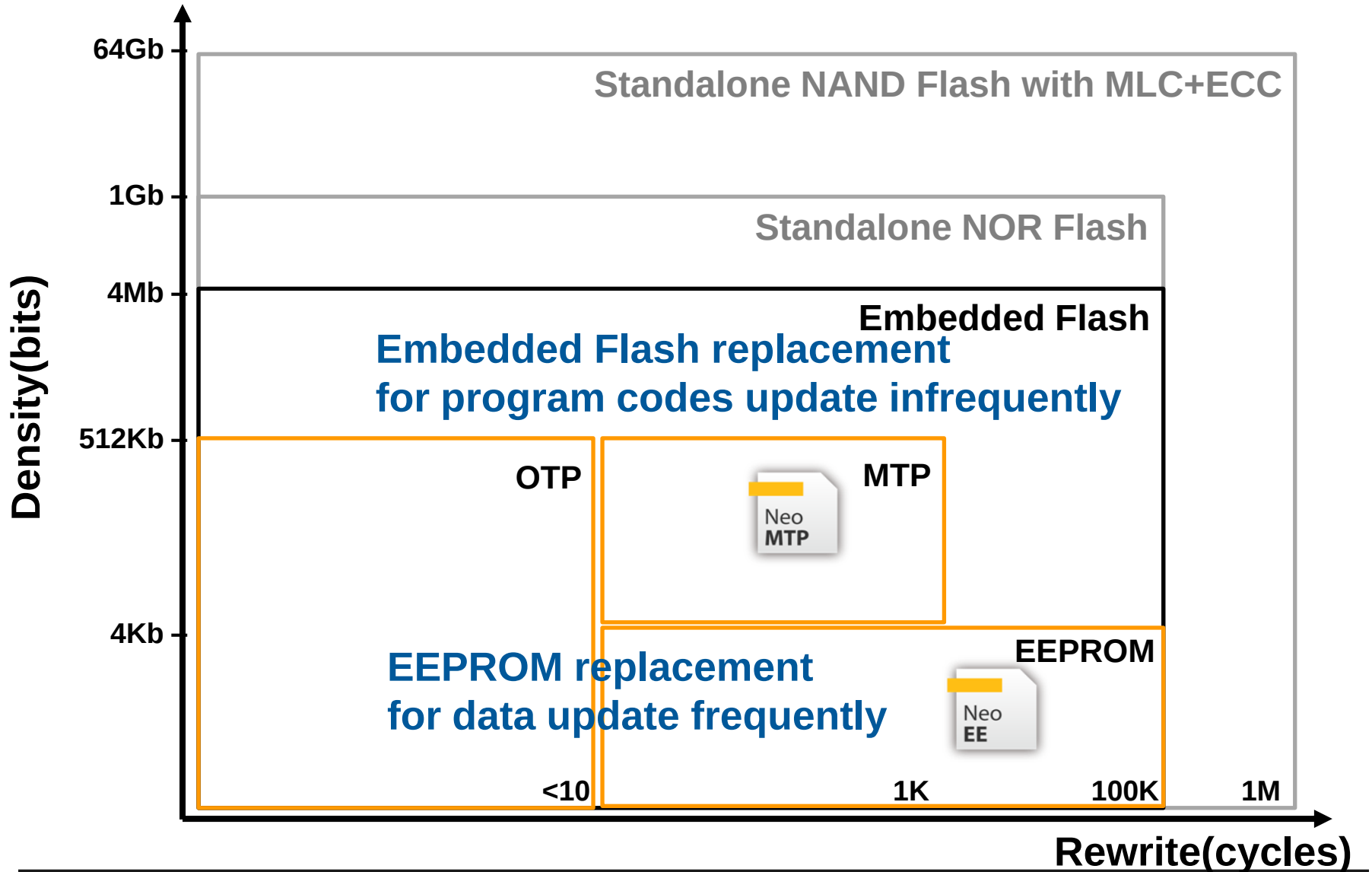
投資安全聲明

除簡報內所提供之歷史信息外，簡報事項係屬預測性陳述，受到風險及不確定性因素影響，可能造成實際結果與陳述內容發生不符，這些不確定性因素包括：技術平台是否順利導入利用、IP是否被客戶接受、客戶產品大量量產之能力及時間、產業及市場對半導體產品之供給及需求移轉、終端市場之穩定性及其他風險等。

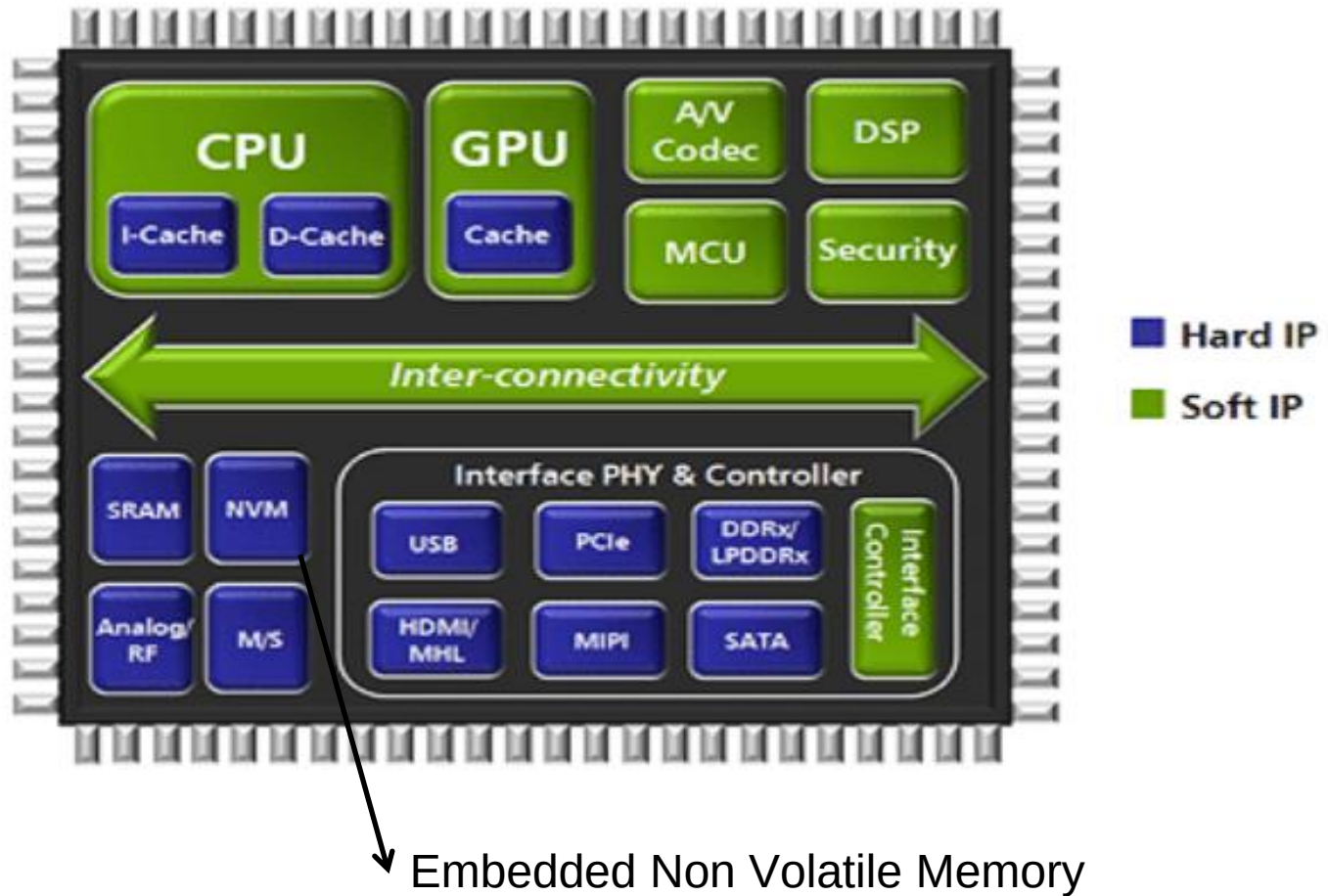
大綱

- 公司營運模式
- 營運回顧
- 成長機會與未來展望
- 問題與回答

嵌入式非揮發性記憶體分類



SOC Block Diagram



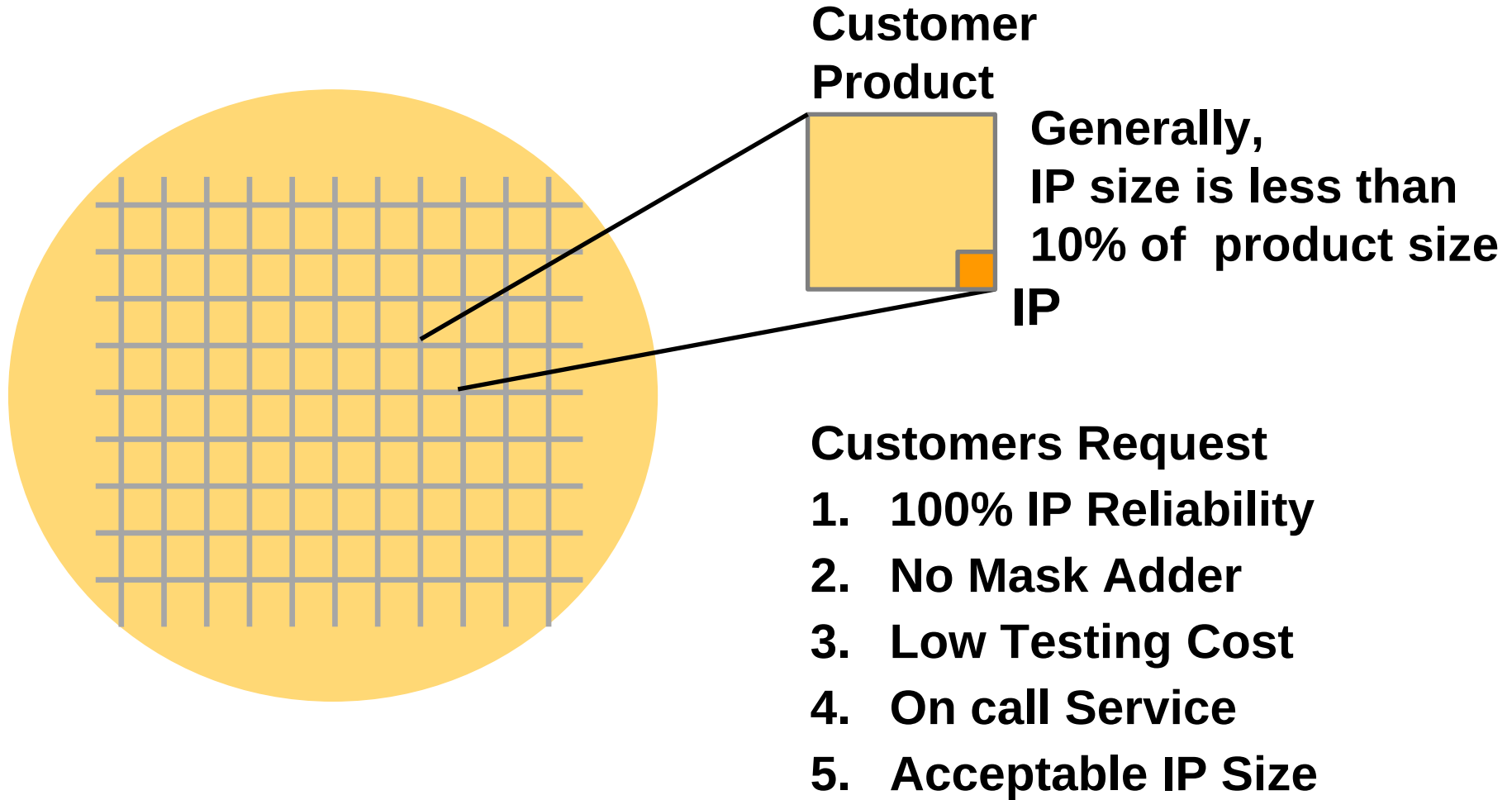
Source : tsmc

嵌入式非揮發性記憶體技術

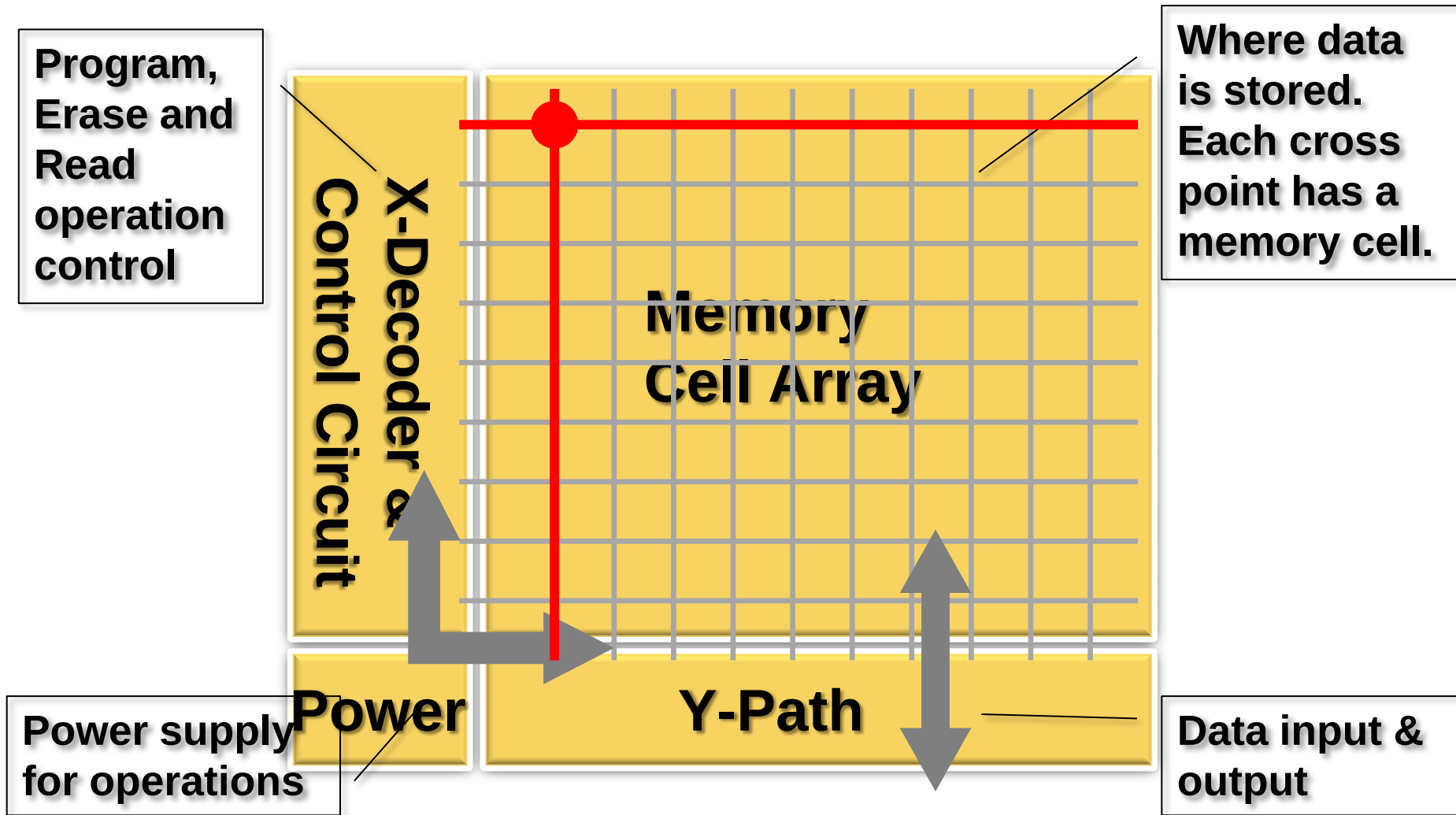
	ROM	eFuse (OTP)	Antifuse (OTP)	CMOS Floating Gate (OTP)	CMOS Floating Gate (MTP)	Embedded Flash
Cell Structure	Transistor	Poly Fuse	Antifuse	Floating Gate	Floating Gate	Floating Gate
Standard CMOS Compatible	Yes	Yes	Yes	Yes	Yes	No
Bitcell Area	< 1	50	1	2	4	1
Endurance	No	No	< 10	< 10	10K-100K	100-1000K
Density	4Kb-1Mb	256bit-4Kb	16bit-1Mb	16Kb-1Mb	1Kb-2M	64Kb-4Mb
Security	Low	Low	High	High	High	High
Additional Steps	None	None	None	None	None	+10 Mask

- ROM not programmable, eFuse cannot scale beyond 16Kb, embedded flash expensive and cannot scale after 40 nm
- eMemory's IPs: OTP (antifuse, floating gate) and MTP (floating gate)

採用IP之考量

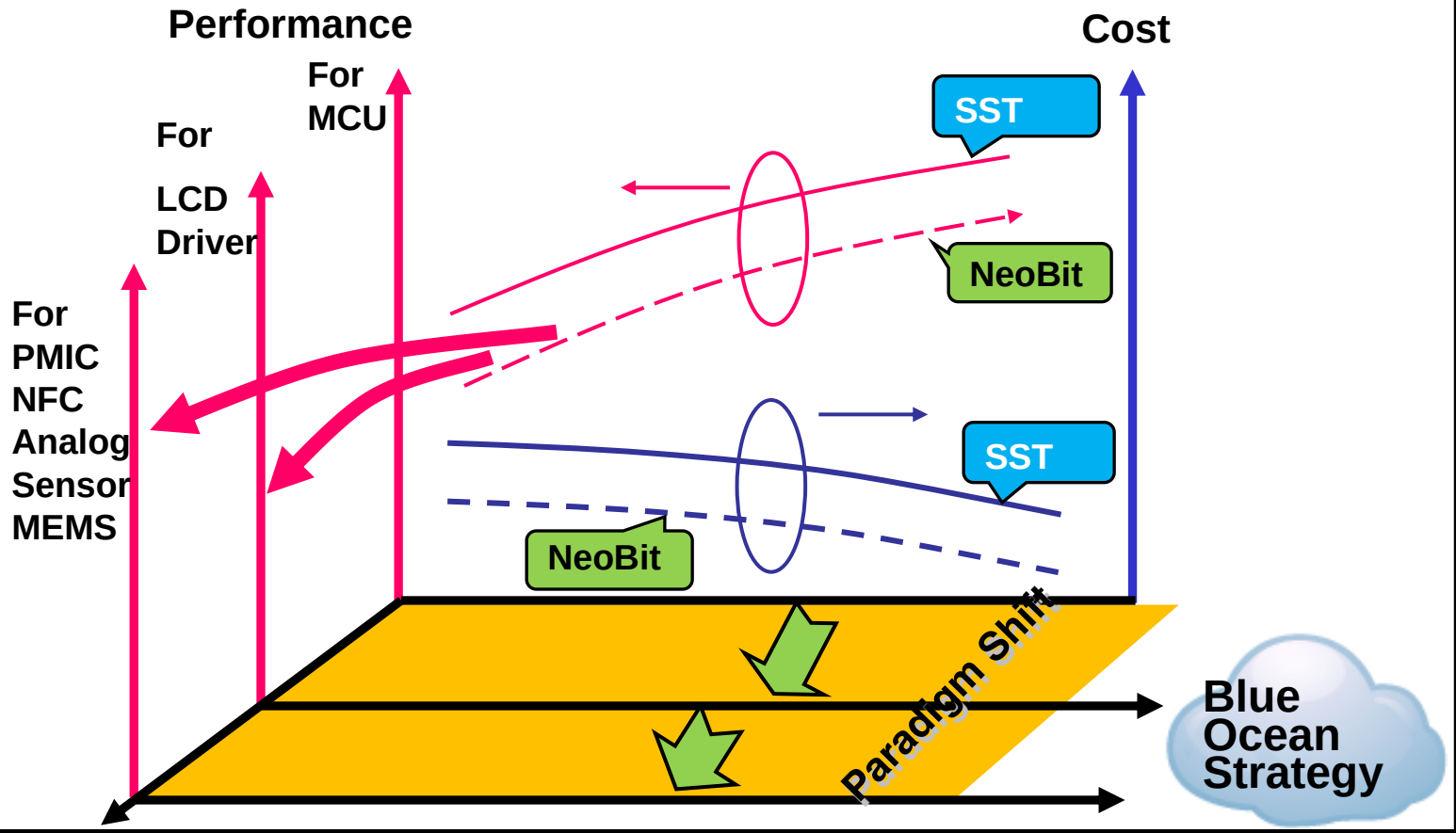


Non-Volatile Memory IP 内部

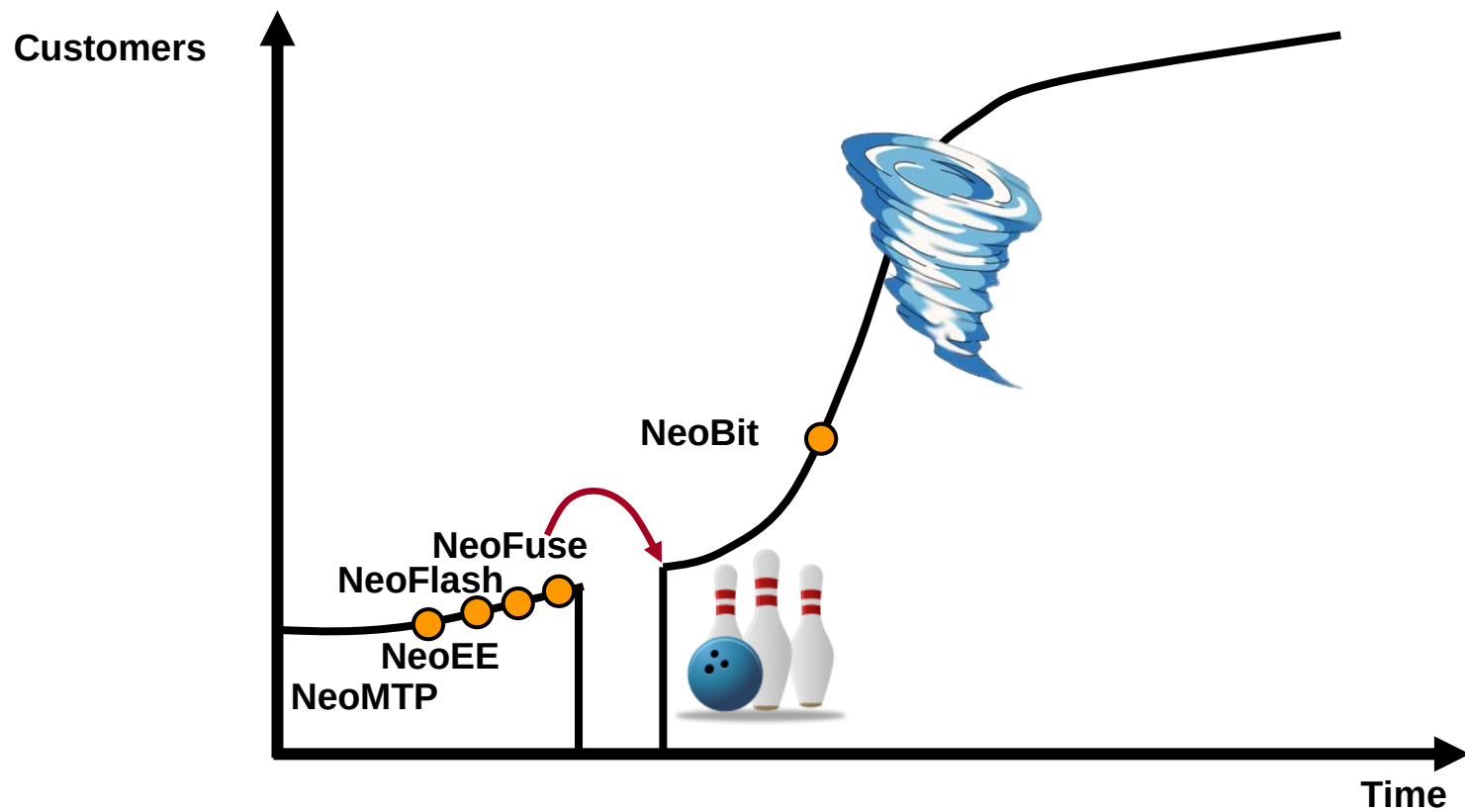


破壞性創新

● *Innovation, Innovation, and Innovation !*

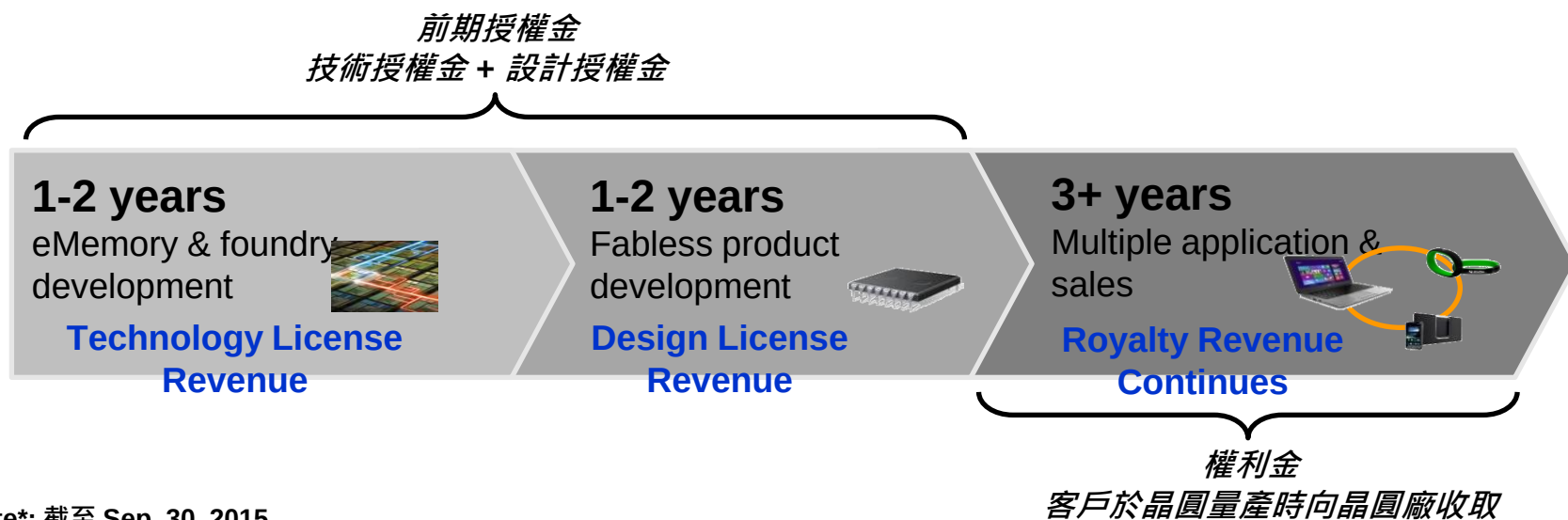


跨越鴻溝



營運模式

- 2000年成立，2002年第一個客戶，2005年開始獲利，2011年掛牌上市，掛牌以來，無市場籌資，無銀行借款，現金配股率超過100%。
- 全世界最大的logic non-volatile memory IP公司，224位員工，153位研發人員*。
- 成長性指標: 1) 正在晶圓廠建構的製程平台數
2) 設計授權數
3) 權利金



Note*: 截至 Sep. 30, 2015

全球客戶



Foundry



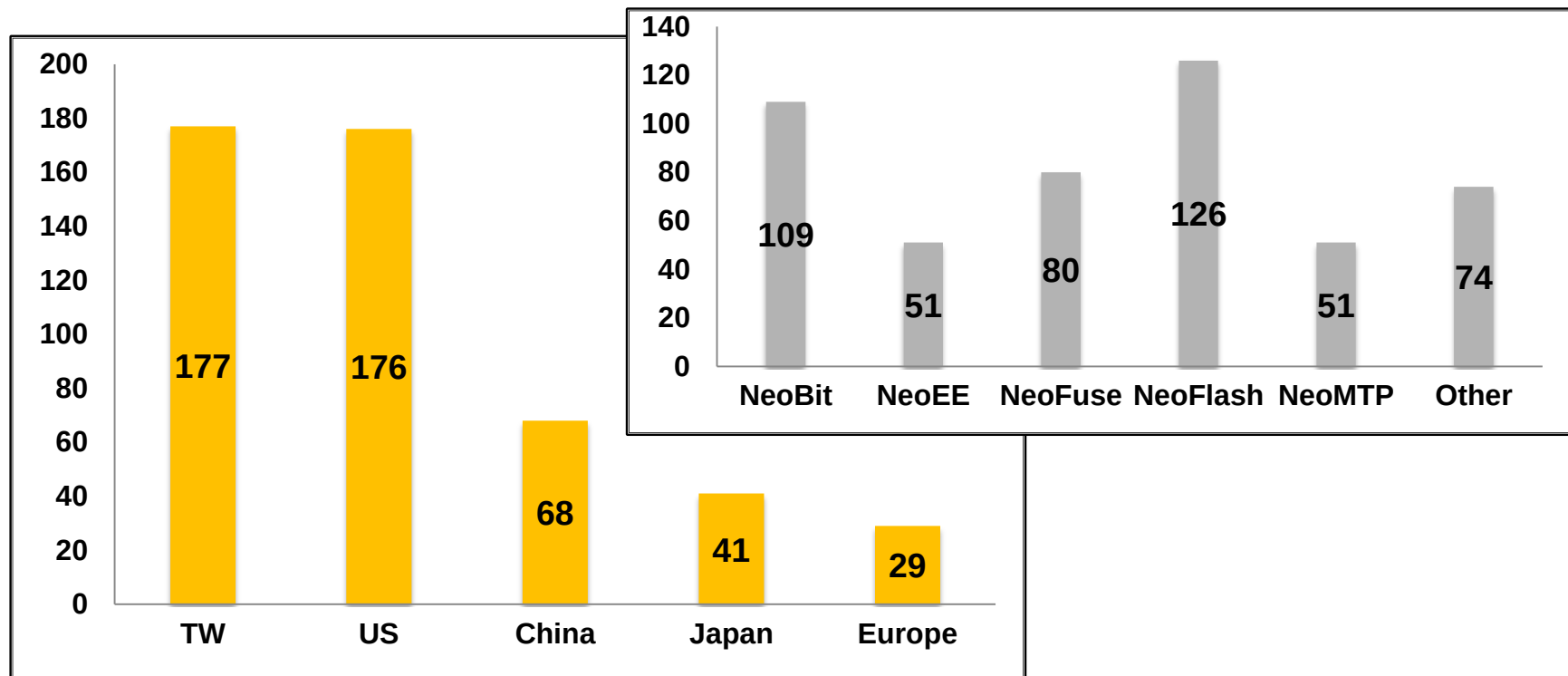
IDM



	Taiwan	China	Korea	Japan	North America	Europe	Others
Foundry	5	7	3	2	1	1	1
IDM	0	0	0	8	2	1	0
Fabless	237	351	51	36	181	94	40

專利佈局

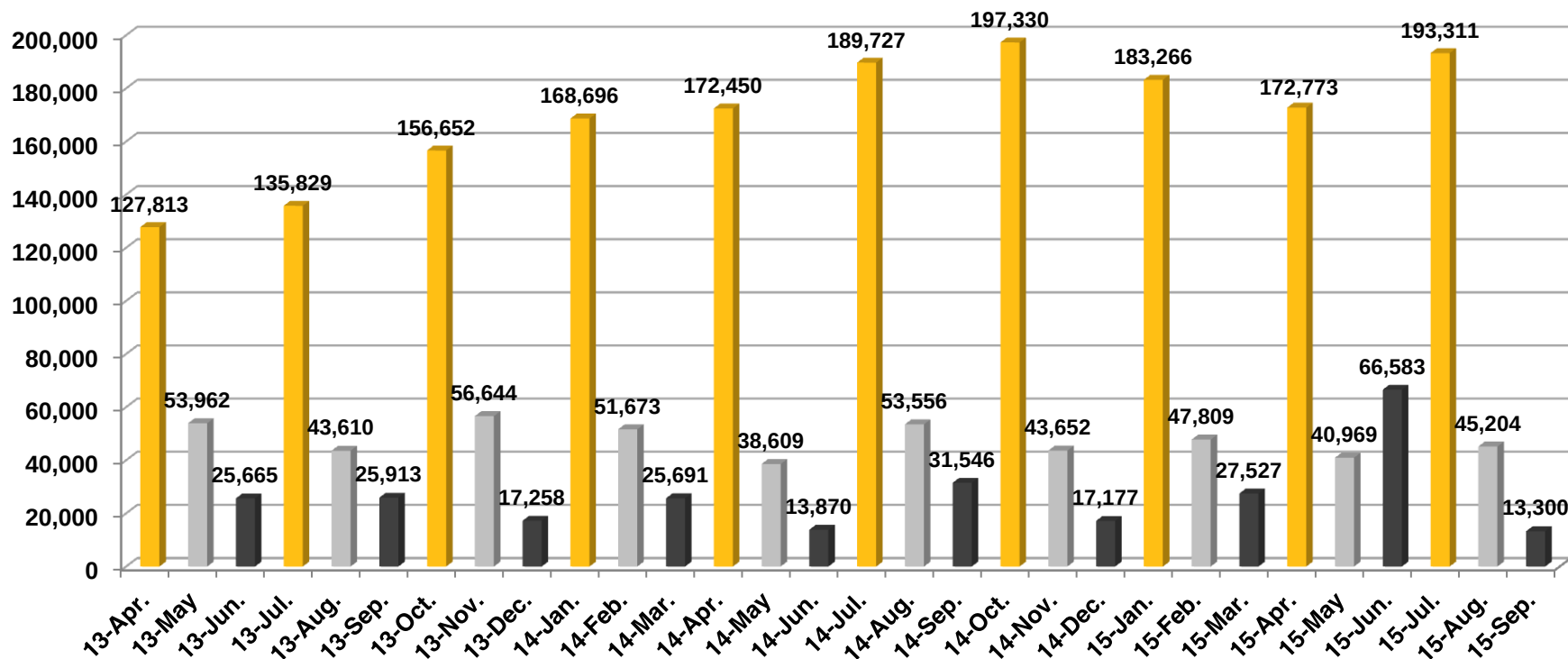
	Q215	Q315	Diff.
Pending	181	185	+4
Issued	287	306	+19
Total	468	491	+23



每季營收模式

- 每季第一個月認列絕大部份晶圓廠前一季使用本公司IP的出貨晶圓權利金及當月產生的技術授權金及設計授權金；第二個月則是少部份晶圓廠權利金及當月授權金；第三個月則無權利金收入，只有授權金。

Unit : NTD Thousands



大綱

- 公司營運模式
- 營運回顧
- 成長機會與未來展望
- 問題與回答

第三季各項營收

單位：新台幣仟元

	Q315	Q215	% change	Q314	% change	2015Q1-Q3	2014Q1-Q3	% change
授權費	38,167	95,982	-60.24%	61,981	-38.42%	198,205	194,224	2.05%
權利金	213,648	184,343	15.90%	212,848	0.38%	592,537	551,594	7.42%
合計	251,815	280,325	-10.17%	274,829	-8.37%	790,742	745,818	6.02%

單位：合約數

	Q315	Q215	2014	2013
技術授權數	4	8	21	19
設計授權數	10	17	82	51
NRE 使用費	76	87	363	342

綜合損益表

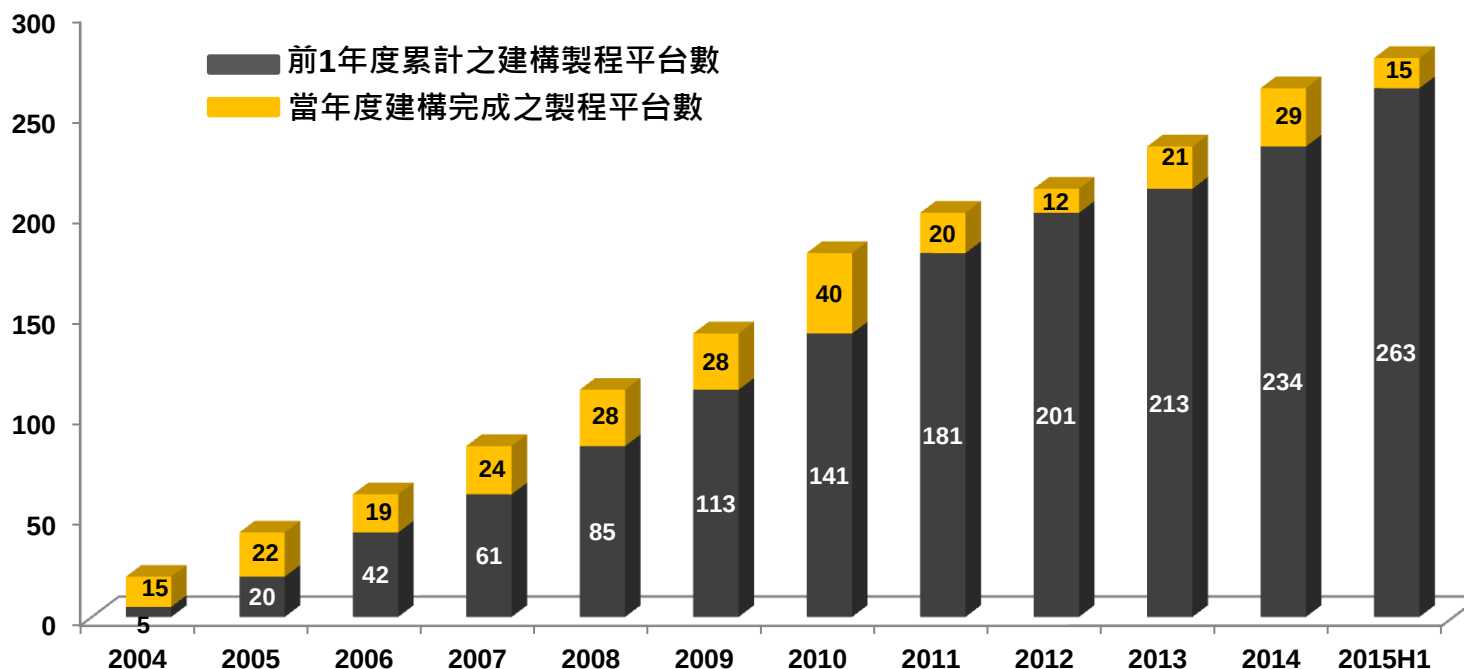
(單位:新台幣仟元)	Q215	Q115	% change	Q214	% change
營業收入淨額	280,325	258,602	8.40%	224,929	24.63%
營業毛利率	100%	100%	-	100%	-
營業費用	141,435	128,976	9.66%	129,406	9.30%
營業淨利率	49.5%	50.1%	-0.6ppts	42.5%	+7.0ppts
本期淨利	130,297	114,423	13.87%	82,385	58.16%
純益率	46.5%	44.2%	+2.3ppts	36.6%	+9.9ppts
每股盈餘 (單位: 新台幣元)	1.72	1.51	13.91%	1.09	57.80%
權益報酬率	30.9%	24.8%	+6.1ppts	20.5%	+10.4ppts

技術授權合約及累計平台數

單位：合約數

年度	2013	2014	2015Q1-Q3
授權數	19	21	17

註：與晶圓廠簽訂的技術授權合約所含的技術製程及授權金視合約內容而定，無特別季節性因素。



目前正在建構的技術製程平台

- Total (As of Jun.) : **80***
- **20** for NeoBit, **26** for NeoFuse, **20** for NeoEE, and **14** for NeoMTP.

	16nm	28nm	40nm	55/65nm	80/90nm	0.11~ 0.13um	0.15~ 0.18um	>0.25 um	Total
NeoBit	-	-	-	-	-	6	12	2	20
NeoFuse	1	7	4	8	1	3	2	-	26
NeoFlash	-	-	-	-	-	-	-	-	-
NeoEE	-	-	2	-	1	6	10	1	20
NeoMTP	-	-	1	1	2	3	7	-	14

Note*: 6 platforms qualified in Q2; 8 platforms kicked off in Q2

目前正在建構的技術製程平台

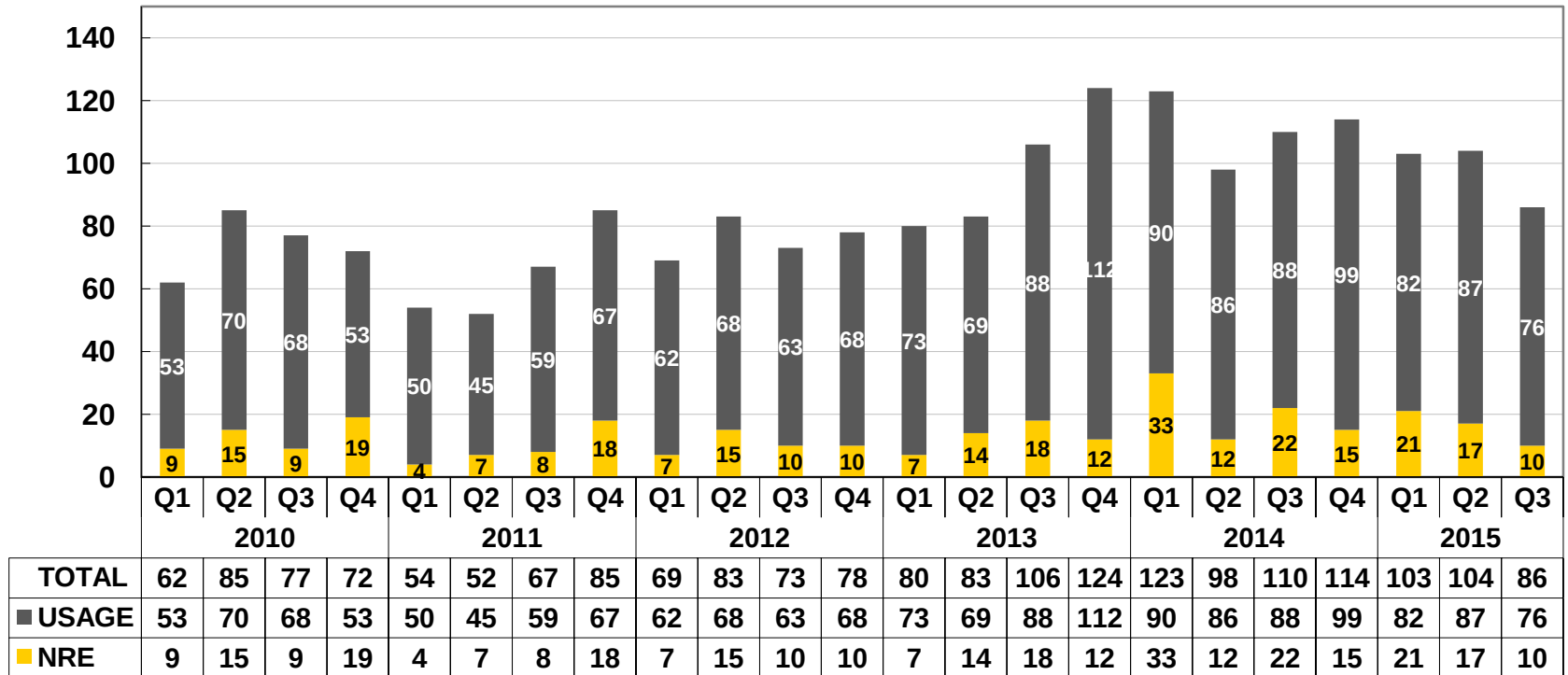
12" Fabs	Production	Development	NVM Type	Process Type
16nm	0	1	OTP	FF+
28nm	3	7	OTP	LP/HPM, HLP/HPM, LPS
40nm	2	7	OTP, MTP	HV-DDI, LP
55/65nm	10	9	OTP, MTP, Flash	LP, HV-DDI, HV-OLED, DRAM, CIS
80/90nm	5	4	OTP, MTP	HV-DDI, HV-OLED, LP
0.13/0.11um	6	3	OTP, Flash	HV-DDI, BCD, Generic
0.18um	1	0	OTP	BCD

8" Fabs	Development	NVM Type	Process Type
0.13/0.11um	15	OTP, MTP, Flash	HV-DDI, BCD, LP, RF, CIS, LL
0.18/0.16/0.152um	31	OTP, MTP	Generic, LP, LL, MR, HV, Green, BCD
0.25um	2	OTP, MTP	BCD
0.35um	1	OTP	UHV

*As of Jun. 30, 2015

每季設計授權數(New Tape Out)

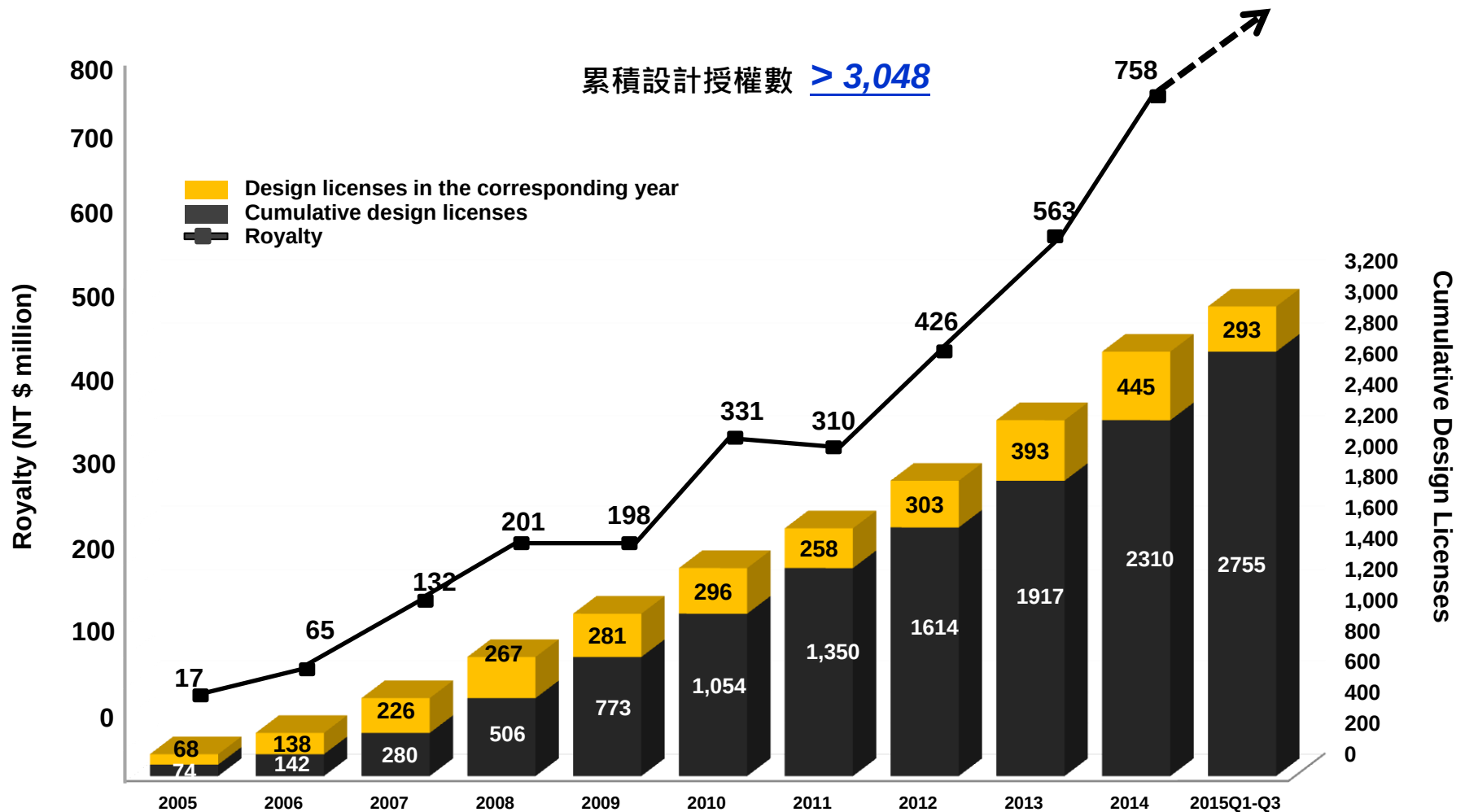
- Total **293** NTO as of Q3 2015 (**445**@2014 **393**@2013, **303**@2012, **258**@2011)



Usage：使用架上已認證及有量產經驗的IP，按年費(不計使用次數)或單次使用收費，設計導入到量產權利金貢獻時間約1年以內。

NRE：客製化的IP，需重新認證，導入到權利金貢獻約1-1.5年

權利金取決於過去累積的設計授權數

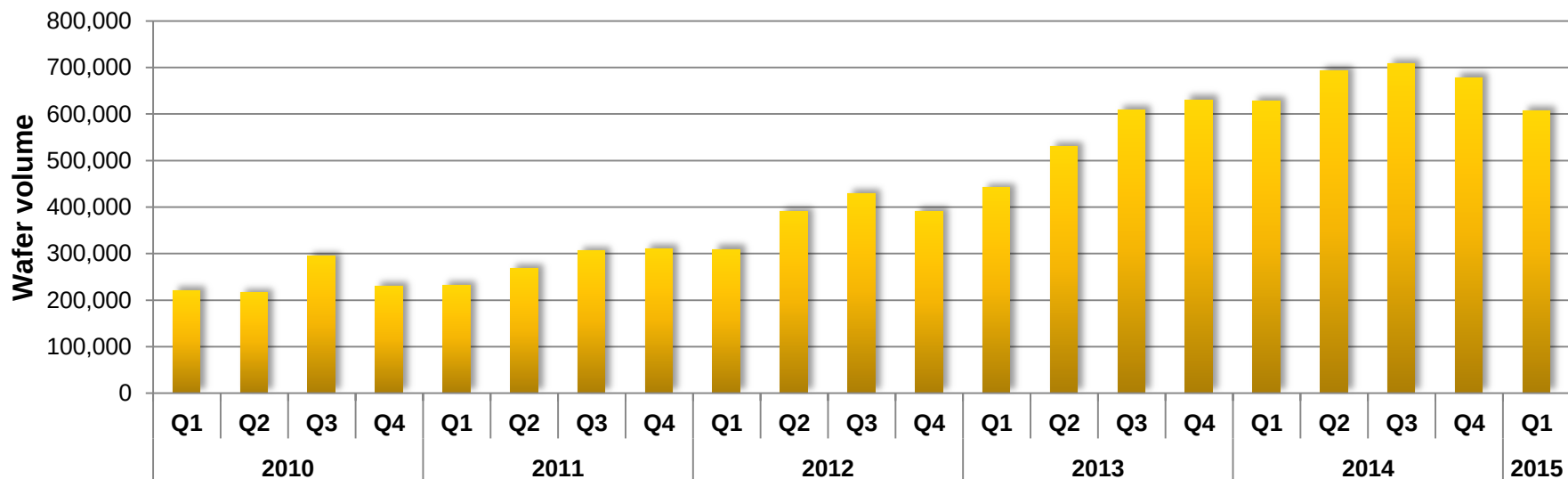


註1. 2009年因整體半導體景氣衰退，權利金年衰退1.5%。

註2. 2011年因2010年單一客戶預付權利金，導致2010年成長67%，2011年年衰退6.3%。

註3. 2009-2013年權利金年複合成長率為30%。

每季量產晶圓片數



embedded eMemory IP in T Company (\$revenue); * % of Process node in T company total revenue in Q215

	Process node	*% of T	Q215	Q115	2014	2013
8"	0.25/0.35	4%	34.4%	32.1%	30.5%	27.3%
	0.15/0.18	13%	8.9%	8%	11.9%	10.7%
	0.11/0.13	3%	17.0%	20.5%	20.8%	19.1%
12"	90nm	7%	19.2%	18.2%	16.3%	4.8%
	65nm	11%	0.4%	0.3%	0%	0%
	40/45nm	14%	0%	0%	0%	0%
	28nm	27%	0.01%	0%	0%	0%
	20nm	20%	0%	0%	0%	0%
8"		21%	14.5%	14.1%	15.6%	14.2%
12"		79%	1.8%	1.5%	1.4%	0.69%
Total		100%	4.5%	4.1%	4.5%	4.1%

大綱

- 公司營運模式
- 營運回顧
- 成長機會與未來展望
- 問題與回答

力旺之NVM技術

- **Logic NVM portfolio offers one-stop-shop solution.**

- › Compatible to any process
- › Robust structure
- › Low process cost
- › Competitive macro sizes
- › Easy integration
- › Easy porting

eMemory's NVM Technology	OTP			MTP	
	NeoBit	NeoFuse	NeoFlash	NeoEE	NeoMTP
Product Type	OTP	OTP	Flash	EEPROM	MTP
Endurance (Cycles)	10	10	1K~10K	10K~100K	1K~10K
Additional Mask Steps	0	0	2-3	0	0
Technology	Floating gate	Anti-Fuse	SONOS	Floating gate	Floating gate
Scalability	Simple	Simple	Simple	Simple	Simple
Memory Density	HD < 512Kb GHD < 16Mb	< 4Mb	< 2Mb	< 4Kb	< 512Kb

力旺IP的應用

12"

8"

16/20nm

28nm

40nm

55/65nm

80/90nm

110/130nm

160/180nm

250nm

350nm

NeoBit

NeoFuse

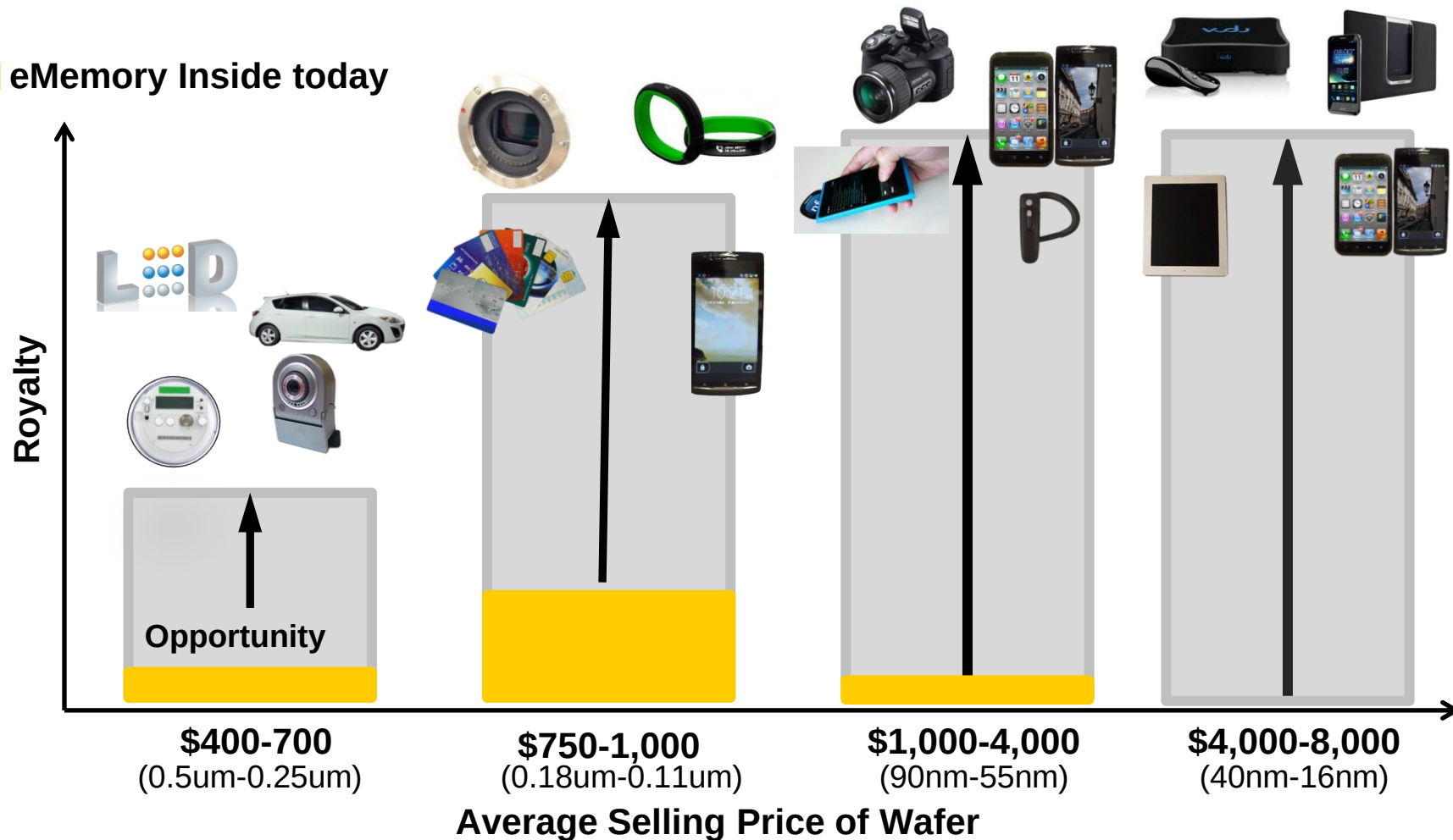
NeoFlash

NeoEE

NeoMTP

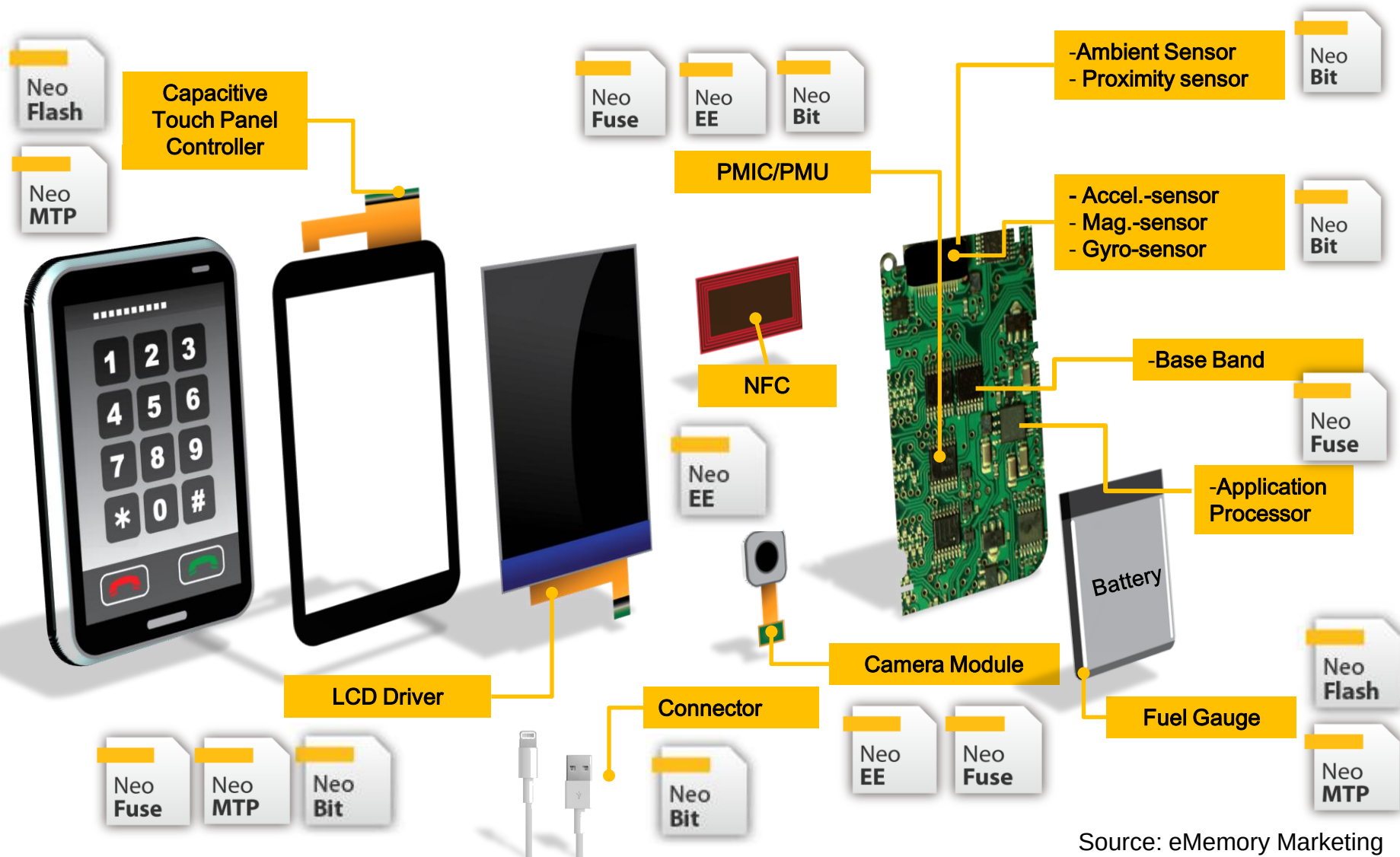
商機與潛力

 eMemory Inside today



Note: 2.2 million 8" equivalent wafers with eMemory IP were shipped in 2013. (~5% of WW foundry shipment)

智慧型手機中力旺 IP 的應用



Source: eMemory Marketing

Benefits from Using eMemory IPs

Design-in for

1. Trimming
2. Parameter Setting
3. Code Storage
4. Identification Setting
5. Encryption
6. Function Selection

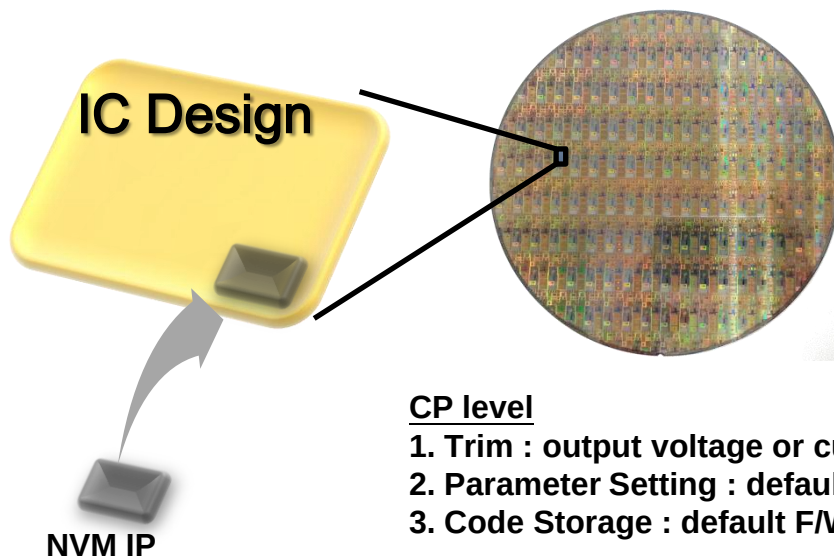
Package/FT level

1. Trim : SPEC shift
2. Parameter Setting : cross chip optimization
3. Identification Setting : manufacturer resume
4. Function Selection : setting for target market

CP Test

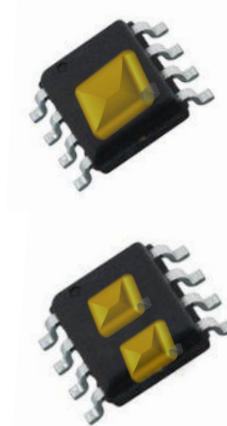
Package/FT

System Assembling



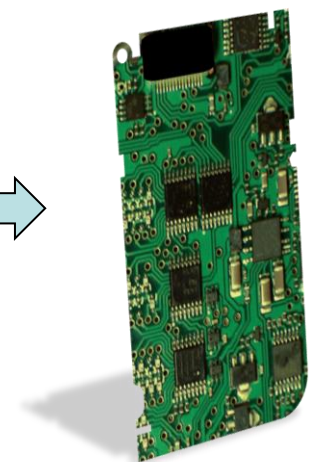
CP level

1. Trim : output voltage or current
2. Parameter Setting : default value
3. Code Storage : default F/W code



System Assembling

1. Parameter Setting : cross chip optimization
2. Code Storage : F/W code modification
3. Identification Setting : manufacturer resume
4. Encryption : Security algorithm or key storage



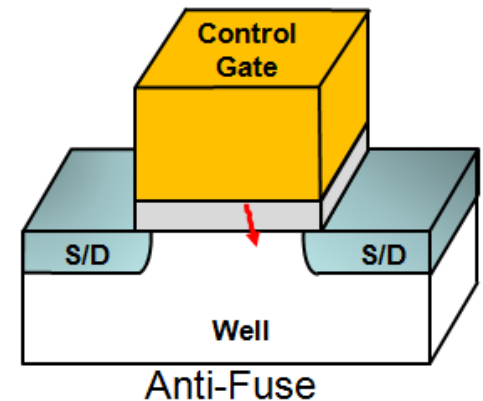
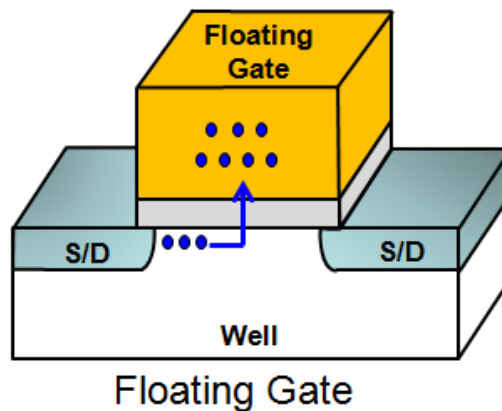
高機密性的安全設定

- Provide “Invisible Hardware Key” for invisible storage
- Prevent reverse-engineering to detect content of security key
- Protect firmware and hardware of ICs from pirating
- Extend & protect customer’s business

eFuse Key: Data is easily observed



Invisible Hardware Key : Data is hard to be detected



硬體設計防護

Authorized Product



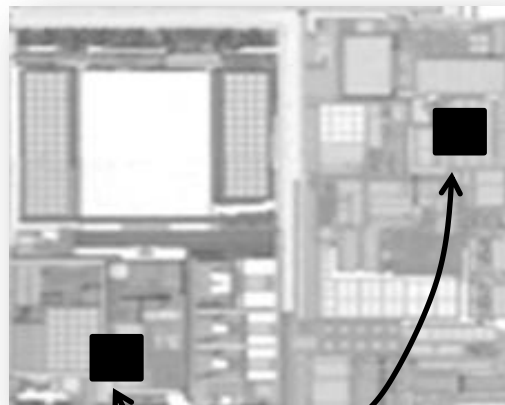
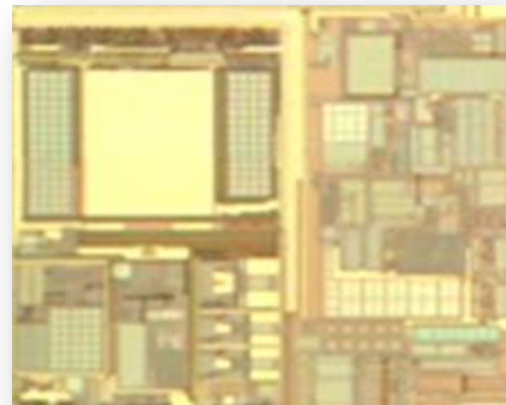
reverse
copy

re-produce



without protection

Fake Product

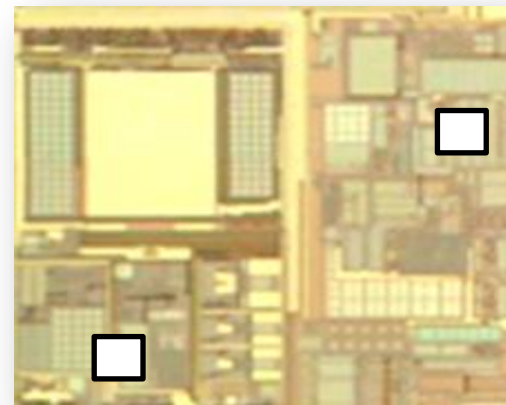


reverse
copy

re-produce



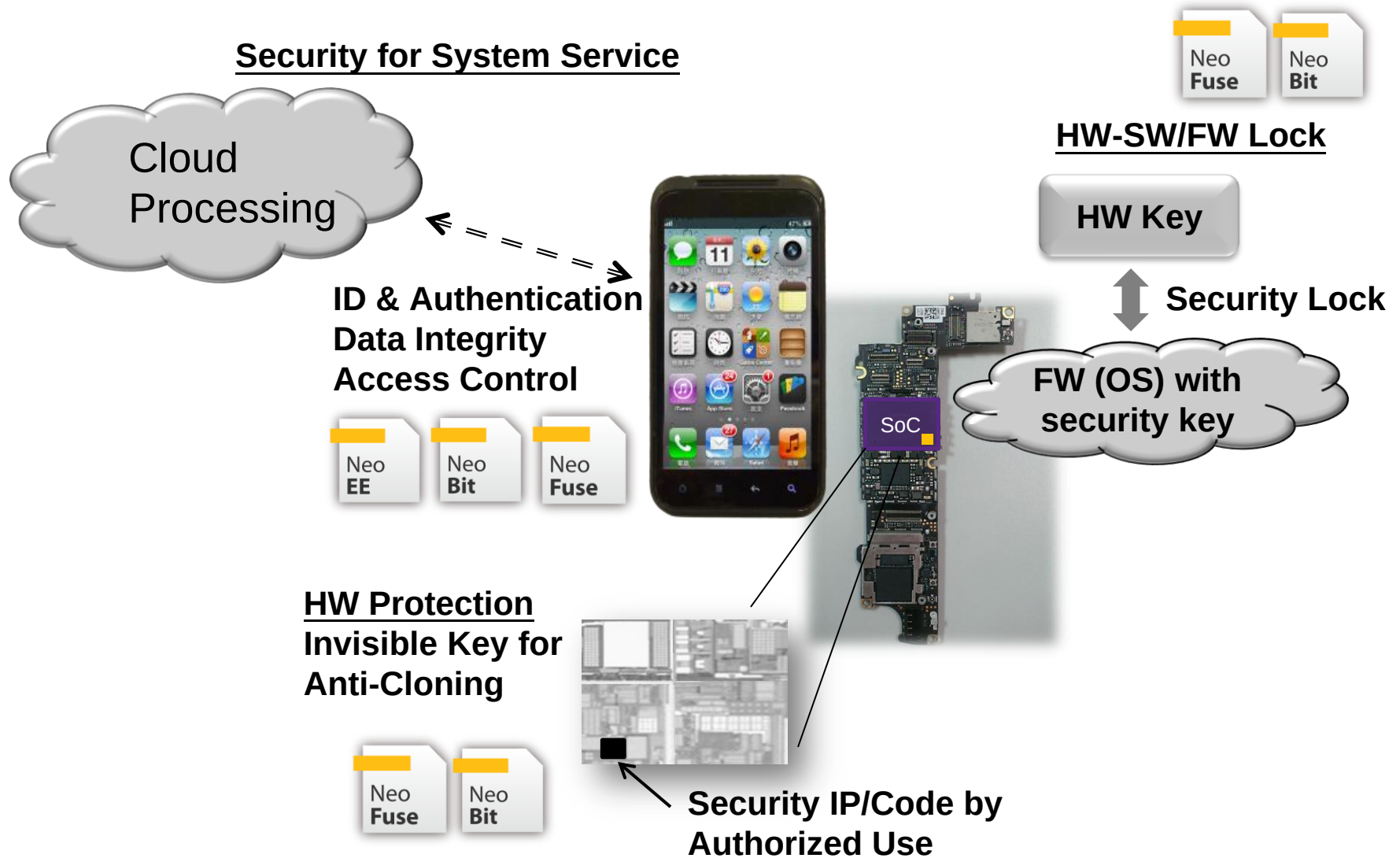
with protection



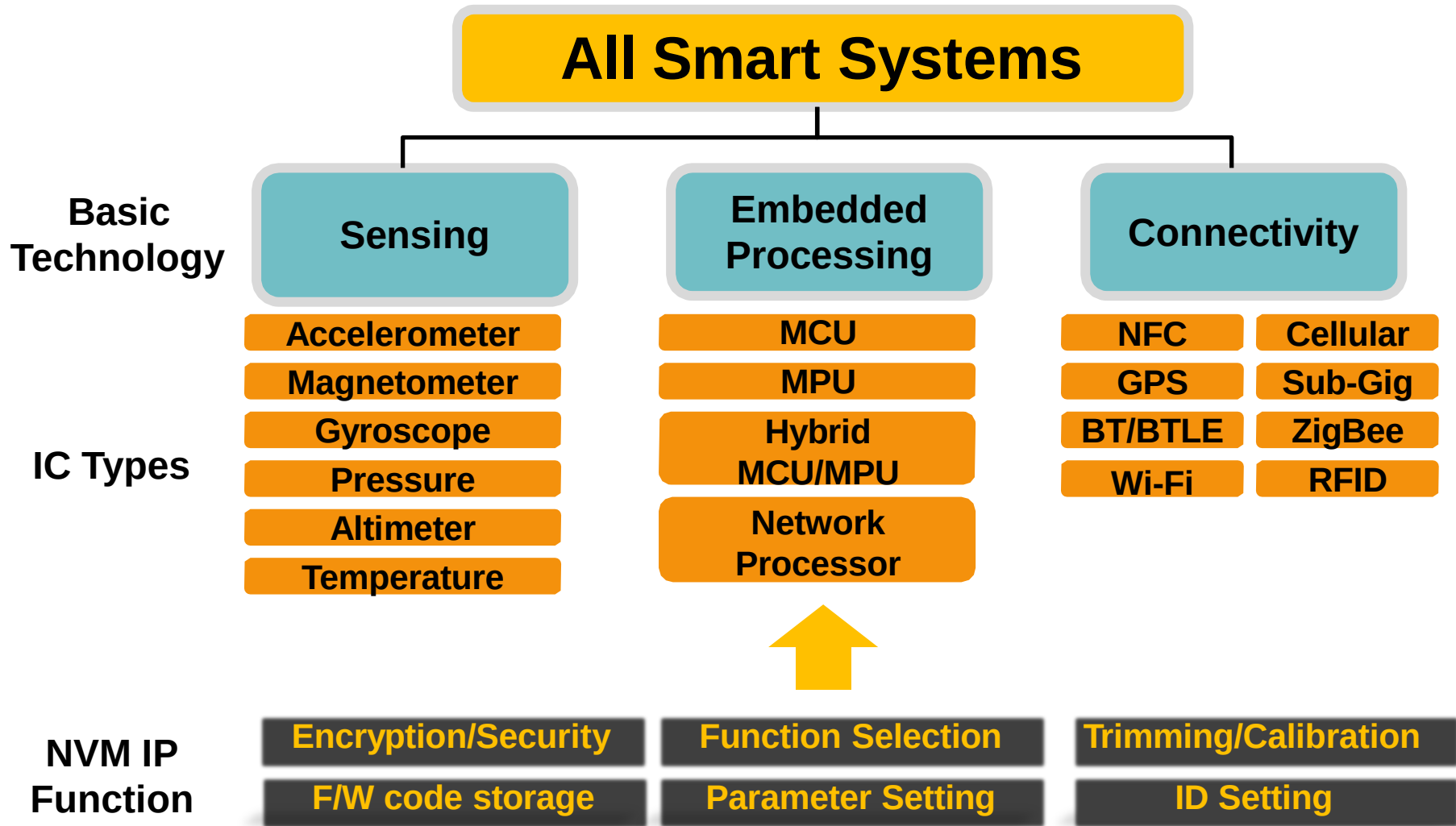
**Security IP/Code by
Authorized Use**

**Can NOT Work w/o
Security IP/Code**

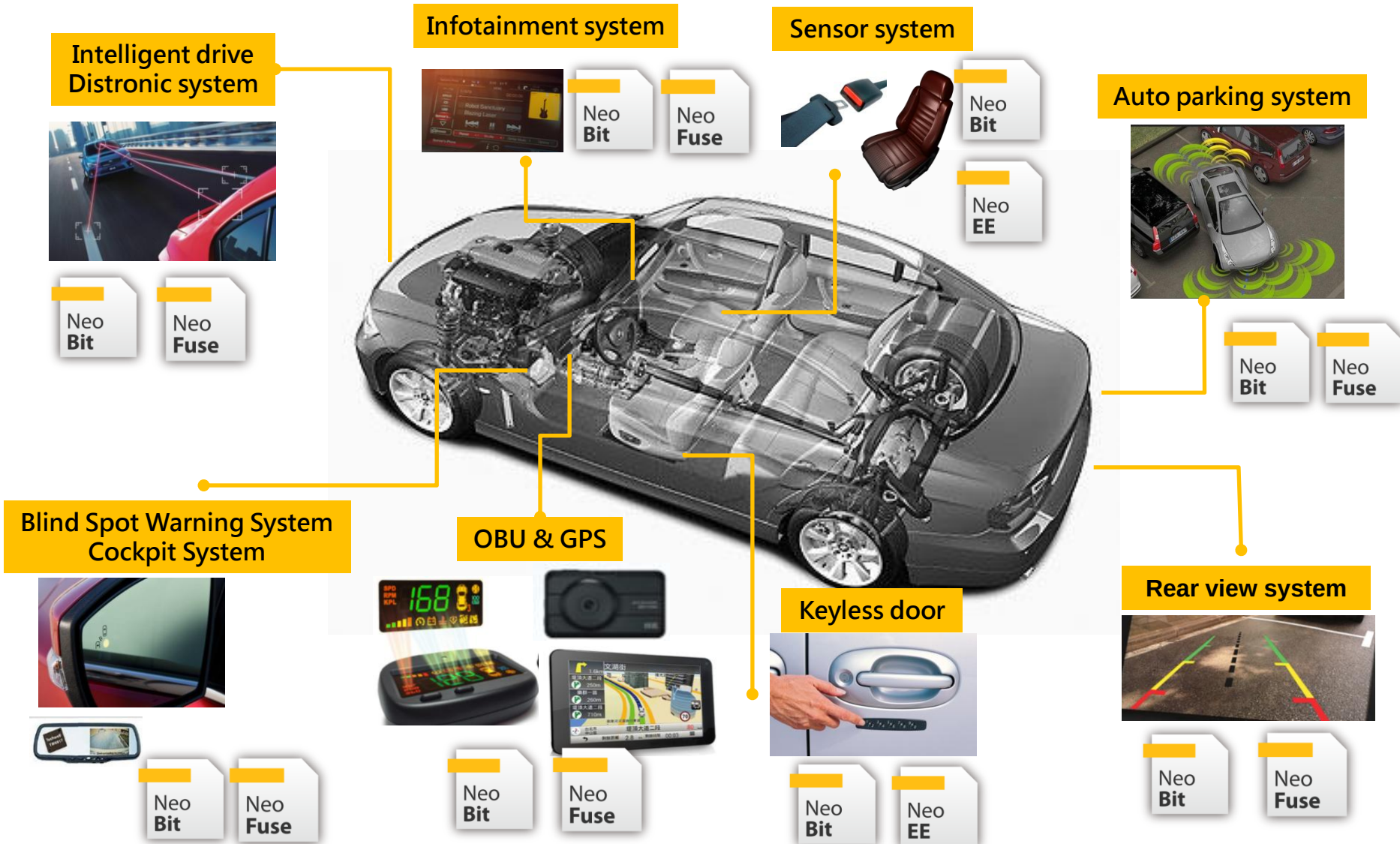
力旺矽智財引領高安全性應用



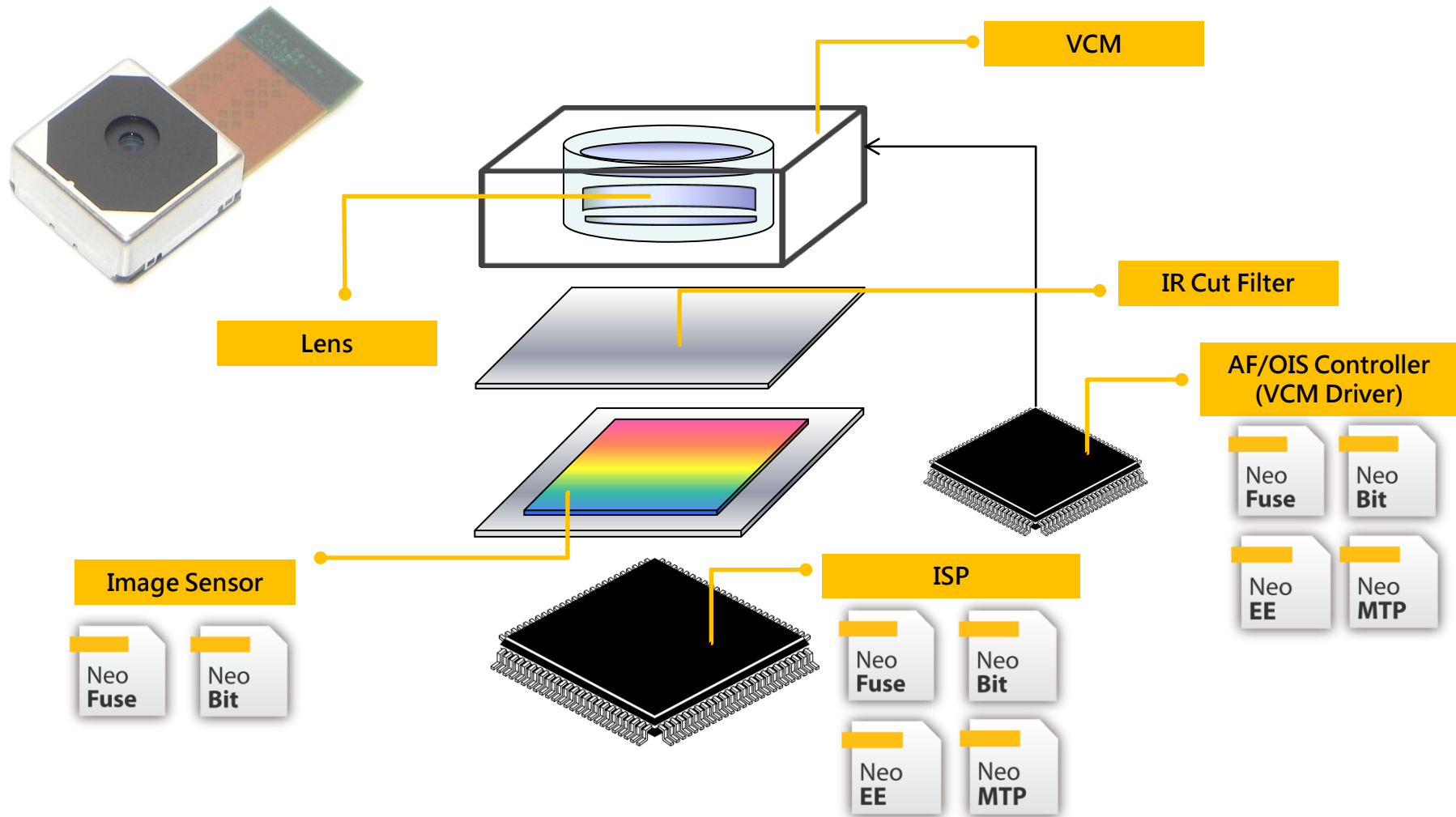
在IoT中之NVM IP 需求



Autotronics with eMemory IPs



Imager Module with eMemory IPs



先進液晶顯示驅動晶片

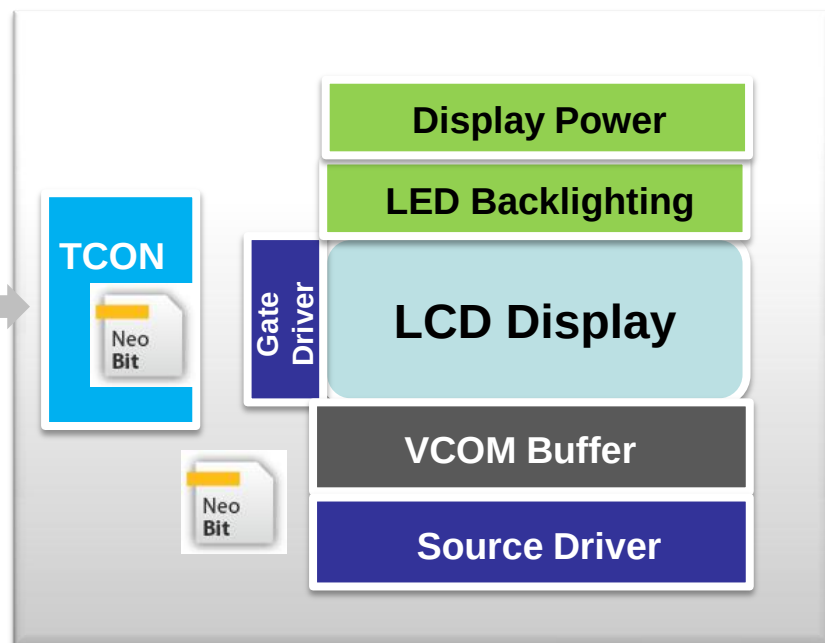
Process Technology : 0.11um HV/80nm HV/55nm HV



I/F
(LVDS, MIPI,...)



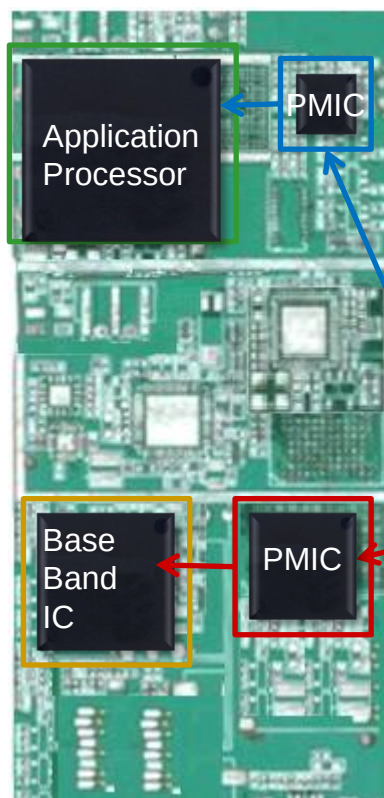
DDI



Density	Endurance	NVM Type	Purpose	NVM Usage
2K8~4K8	1	OTP	Trimming	1. Accuracy enhancement 2. Mismatch cancellation
			Code Storage	1. Gamma Correction Table 2. Timing Control Pattern 3. Color Engine Enhancement

應用於Baseband與Application Processor的電源管理晶片

Process Technology : Advanced 0.25um BCD/ 0.18um BCD/ 0.13um BCD
Mature 0.18um/0.16um/0.152um Logic



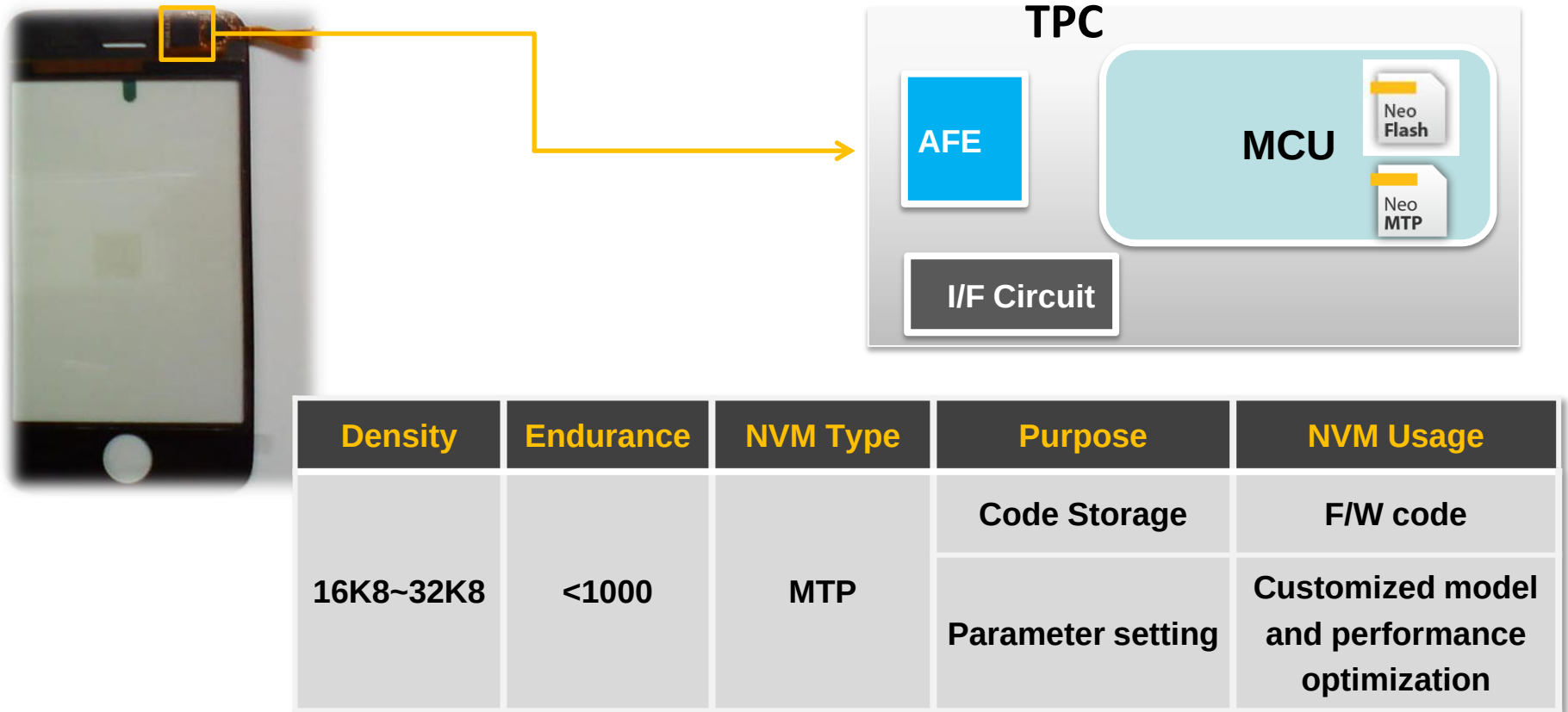
Density	NVM Type	Purpose	NVM Usage
2Kb~4Kb	OTP	Trimming	DC/DC, Bandgap
		Parameter Setting	Design flexibility & Performance optimization
		Code Storage	Start-up behavior & smart power saving algorithm

PMIC



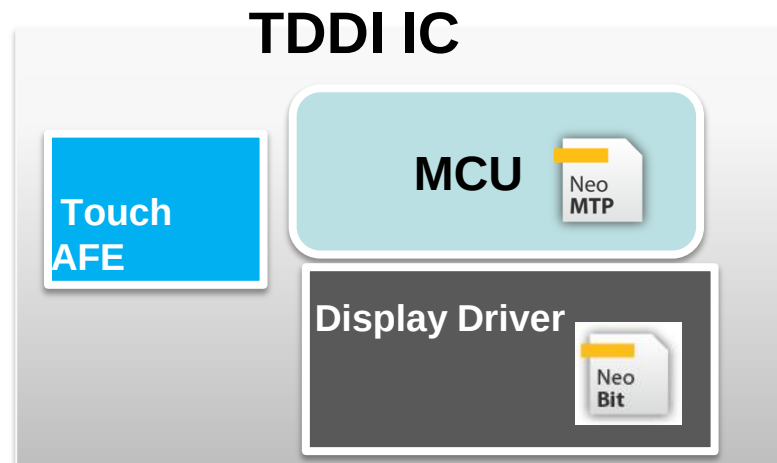
觸控面板控制器晶片

Process Technology : 0.16um HV/0.11um G



內嵌式觸控面板控制器晶片

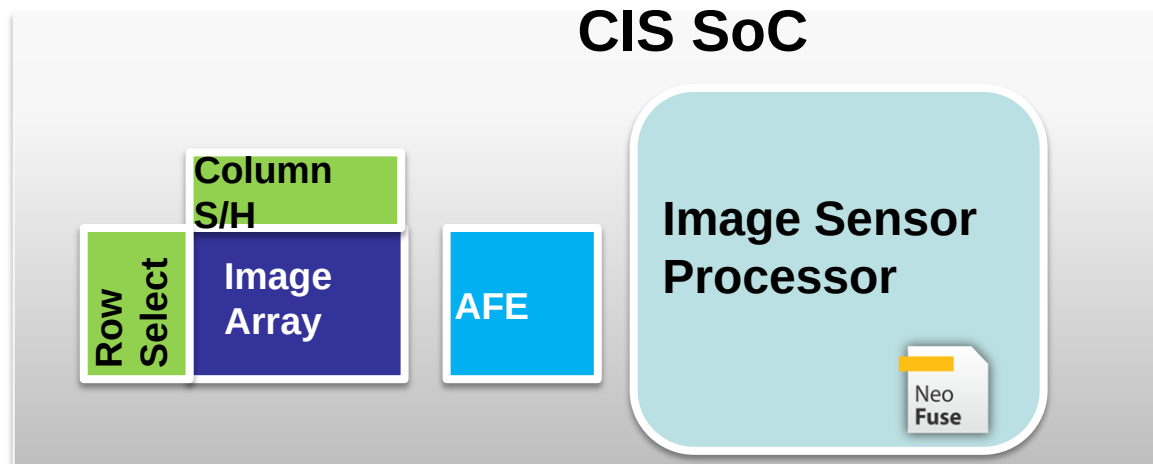
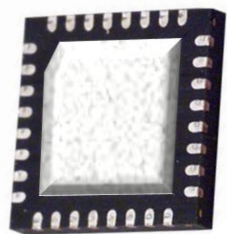
Process Technology : 0.11um HV/80nm HV/55nm HV



Density	Endurance	NVM Type	Purpose	NVM Usage
2K8~4K8	1	OTP	Trimming	Accuracy
			Code Storage	Gamma Table
16K8~32K8	<1000	MTP	Code Storage	Touch F/W Code
			Parameter setting	Performance Optimization

CMOS 影像感測器

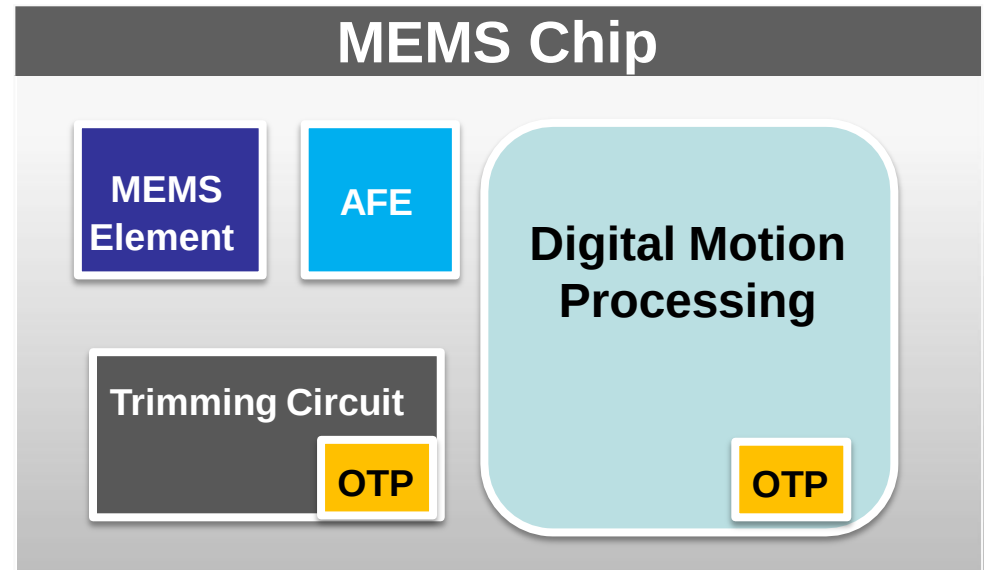
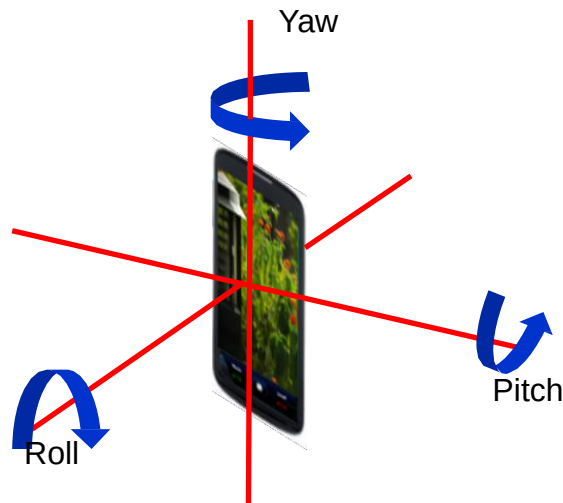
Process Technology : 0.11um CIS/90nm CIS/65nm CIS



Density	Endurance	NVM Type	Purpose	NVM Usage
2Kb~4Kb	1	OTP	Identification Setting	Product Code
			Parameter Setting	Start-up Initial Setting
32K8	1	OTP/ROM	Code Storage	Boot Load

微機電系統(MEMS)

180/160/15x nm HV/Logic for MEMS Controller

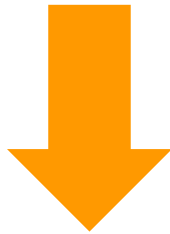


Density	NVM Type	Purpose	NVM Usage
2Kb~4Kb	OTP	Trimming	Factory trimming
		Parameter Setting	Signal filtering
		Code Storage	Geometric computation

取代嵌入式快閃記憶體之競爭優勢

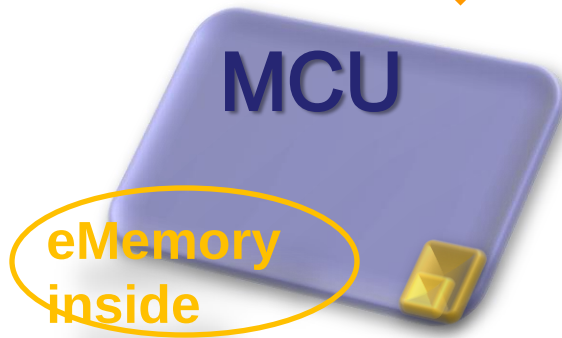


product design & manufacturing by
embedded Flash
Logic Process + 10 Masks



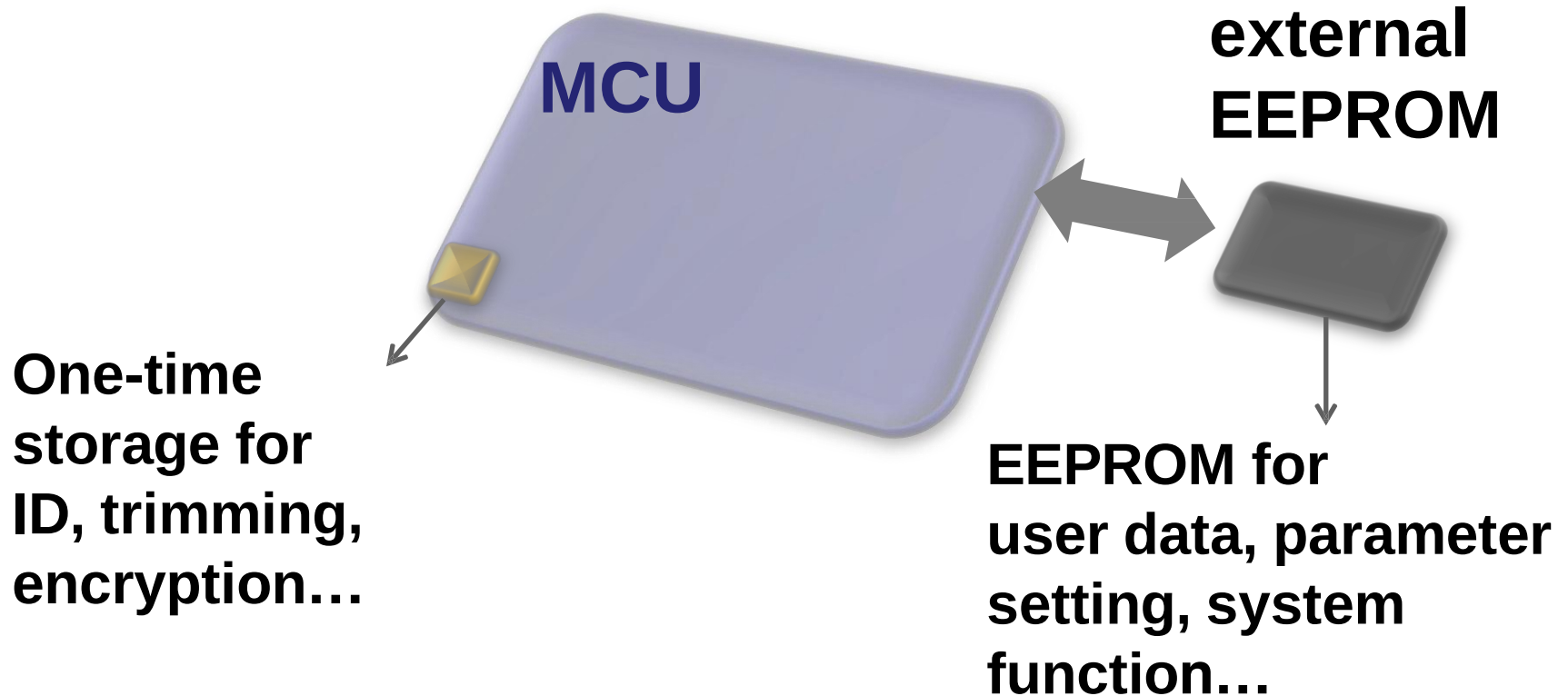
***30% more
cost reduction***

***wafer cost &
testing time***



product design & manufacturing by
Embedded Logic NVM (OTP/MTP)
Logic Process

EEPROM應用於MCU



NeoBit + NeoEE

Hybrid NVM solution (NeoBit + NeoEE) with customized SPEC & optimized size



- **One single IP by integration of NeoBit & NeoEE**
- **Help for system size reduction**

按IC種類之晶圓需求

IC Type	Equ. to 8-inch wafer (K)
AP	4964
PMU	4756
CIS sensor	4226
Fingerprint	4000
Smart card controller	3000
Base Band	2935
LCD driver (with TCON)	2013
Gauge IC	627
Touch panel controller (C)	556
Connectivity	395
STB controller	335
TV controller	327
Wifi controller	245
LED driver	243
DC-DC/AC-DC	176
Accelerator sensor controller	124
Light snesor	121
Bluetooth controller	121
Gyroscope sensor controller	104
TAG IC	76
DVD controller	67
MCU (8bits, LV/3.3V)	56
MCU (8bits, LV/3.3V)	56
P-Gamma	52
MCU (8bits, pure 5V)	51
NB CAM controller	42
Pressure sensor controller	20
Touch pad controller	18
PC CAM controller	15
Touch panel controller (R)	5
TCON (w/o driver)	4

2014.8.29 updated

未來展望

- 主要智慧型手機客戶的晶片應用持續成長，並擴展至穿戴式裝置。
- 電源管理晶片應用持續導入中國手機品牌且擴大量產，快速充電及無線充電應用導入。
- TDDI 與 55nm LCD Drivers 開始進入量產。
- Set up box, 指紋辨識及CIS預期下半年開始進入量產。
- 由於安全性需求日益增高及生產製造的良率考量，在先進製程以NeoFuse取代e-fuse正在加速進行。
- 與領導級晶圓代工廠及歐洲車用電子客戶共同合作，推出車用級矽智財。

成長驅動力

Growth in value per mobile devices

- More chip applications per smartphone/tablet product.

Growth into more markets

- From consumer electronics and mobile devices to wearable devices.
- Adding new NVM product lines further enable more product applications.

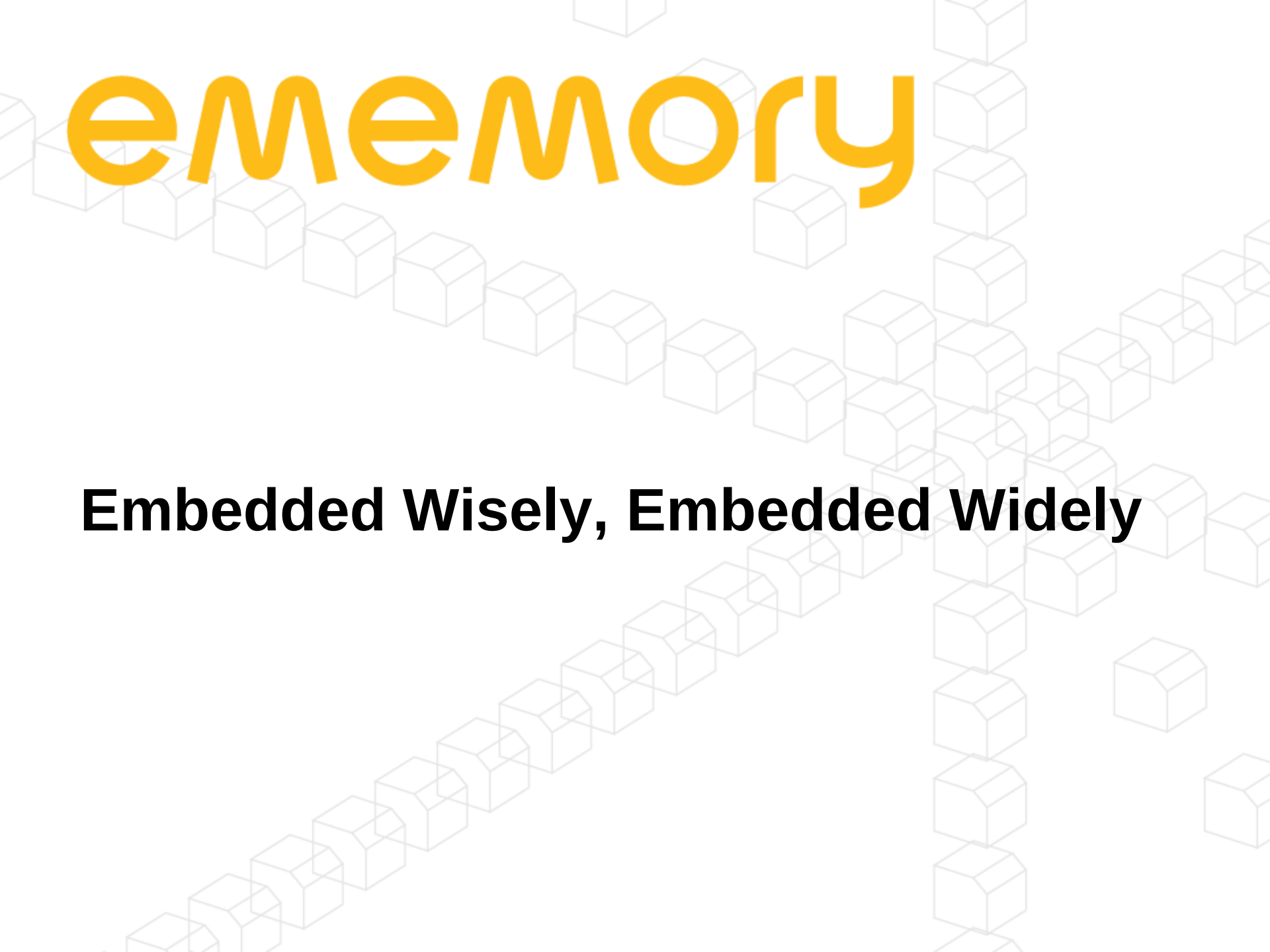
Growth in advanced technology

- Higher royalty per wafer is contributed from more advanced technology nodes.

Great IoT era

- Embedded Logic NVM will be a must.

Q & A



ememory

Embedded Wisely, Embedded Widely