

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**

November, 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。
eMemory, NeoBit, NeoFlash, NeoEE, NeoMTP 與 NeoFuse 皆為力旺電子在台灣或其他國家之註冊商標或服務標章。

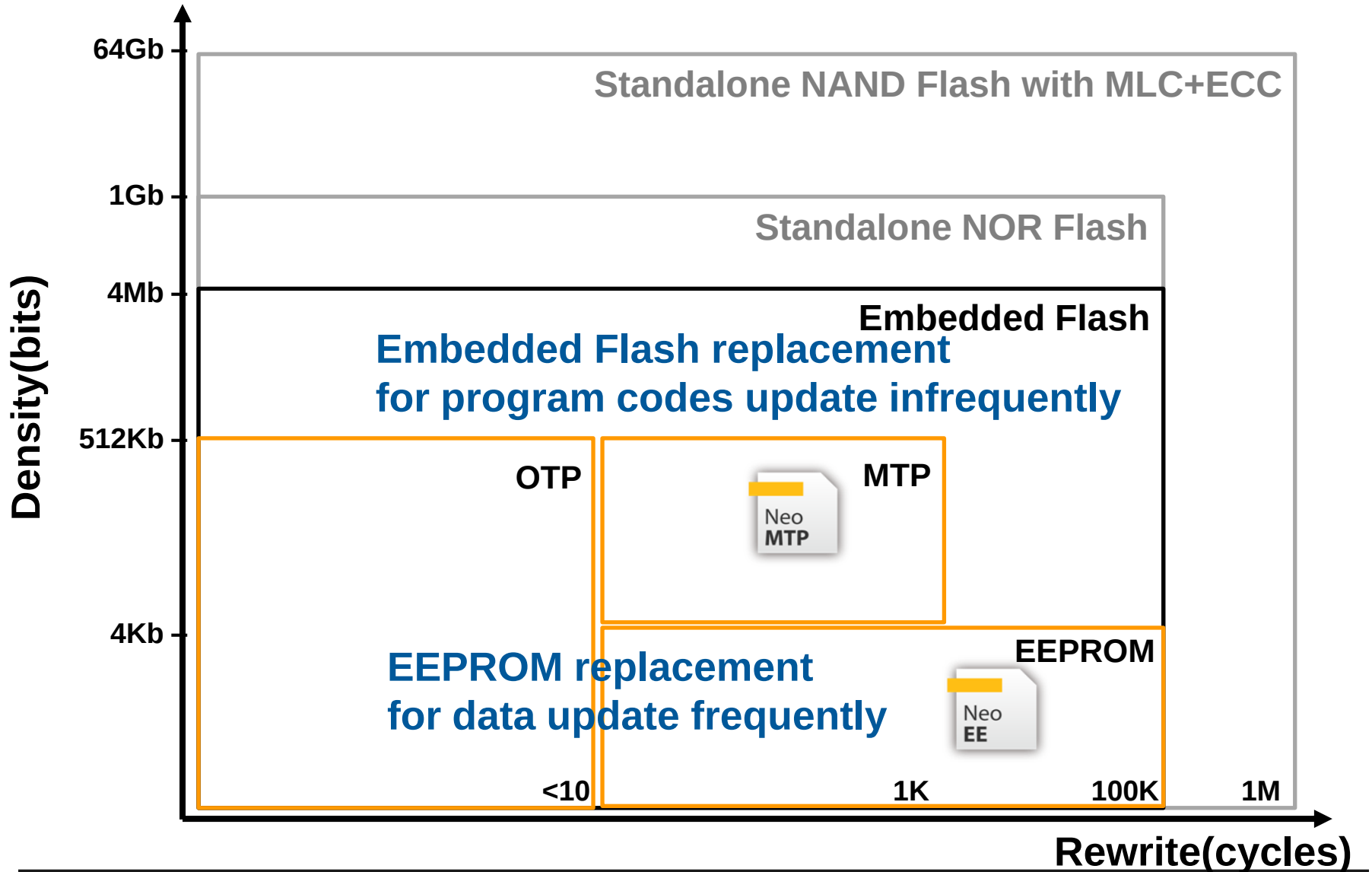
投資安全聲明

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。

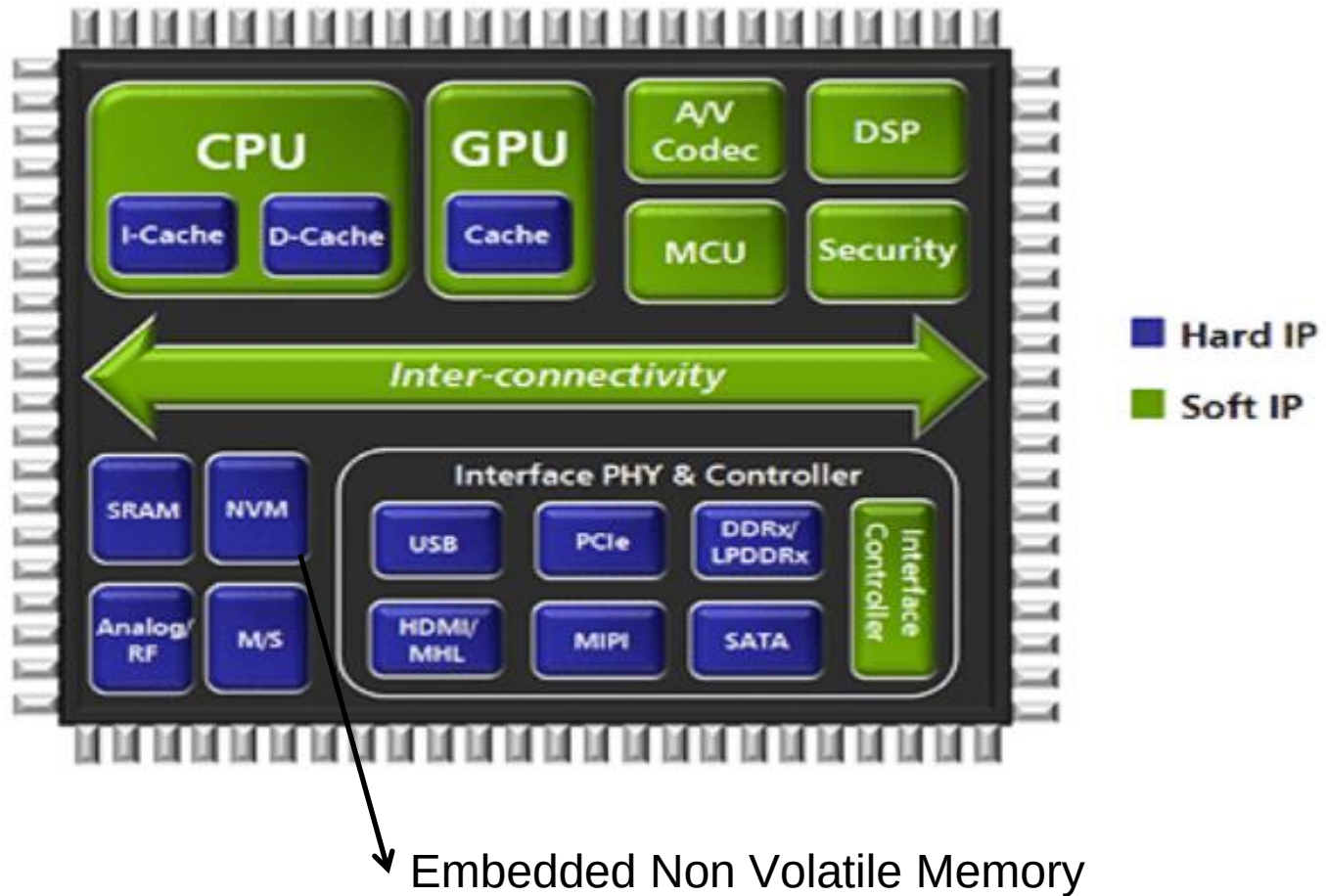
大綱

- 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



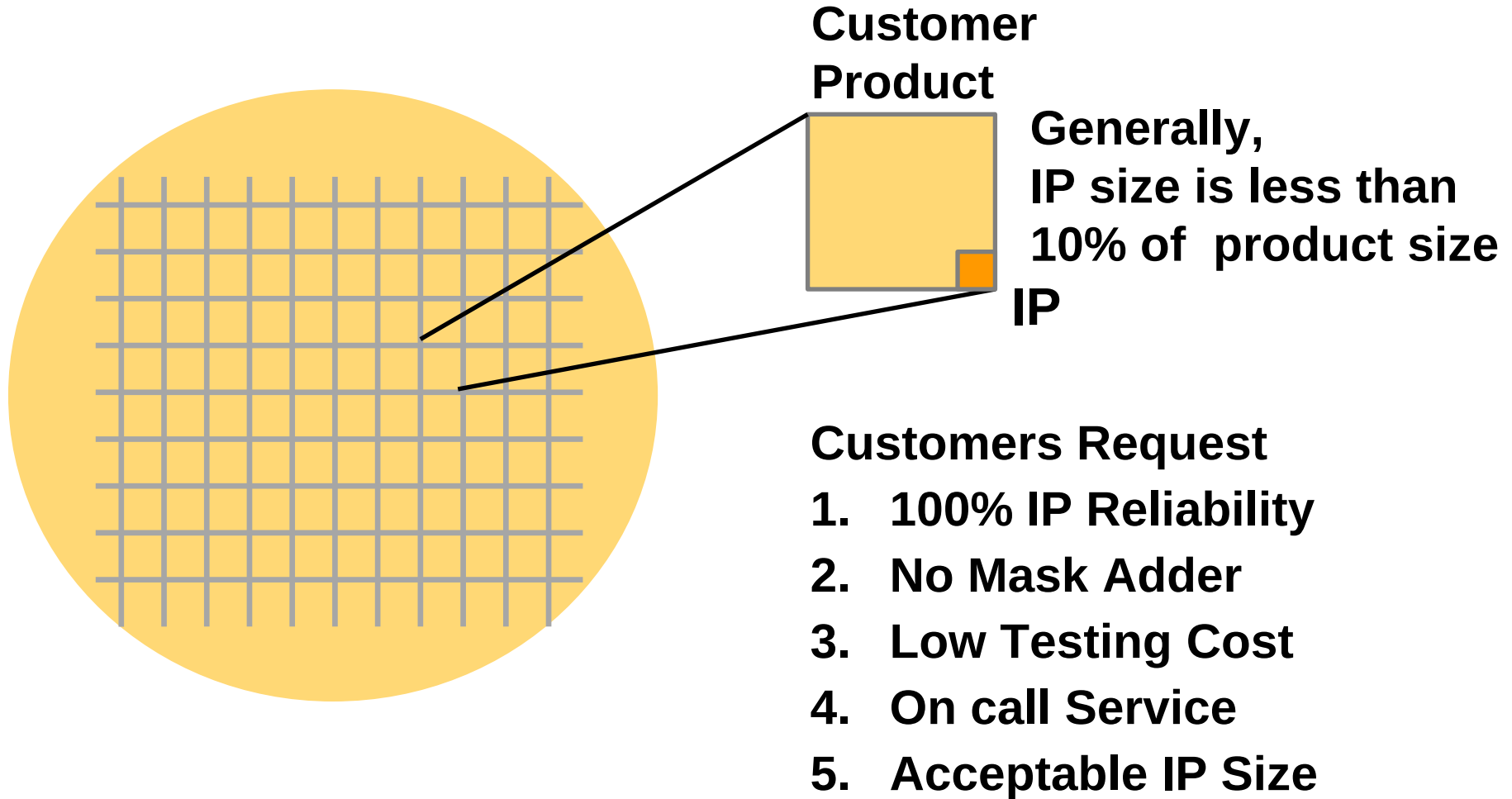
Source : tsmc

嵌入式非揮發性記憶體技術

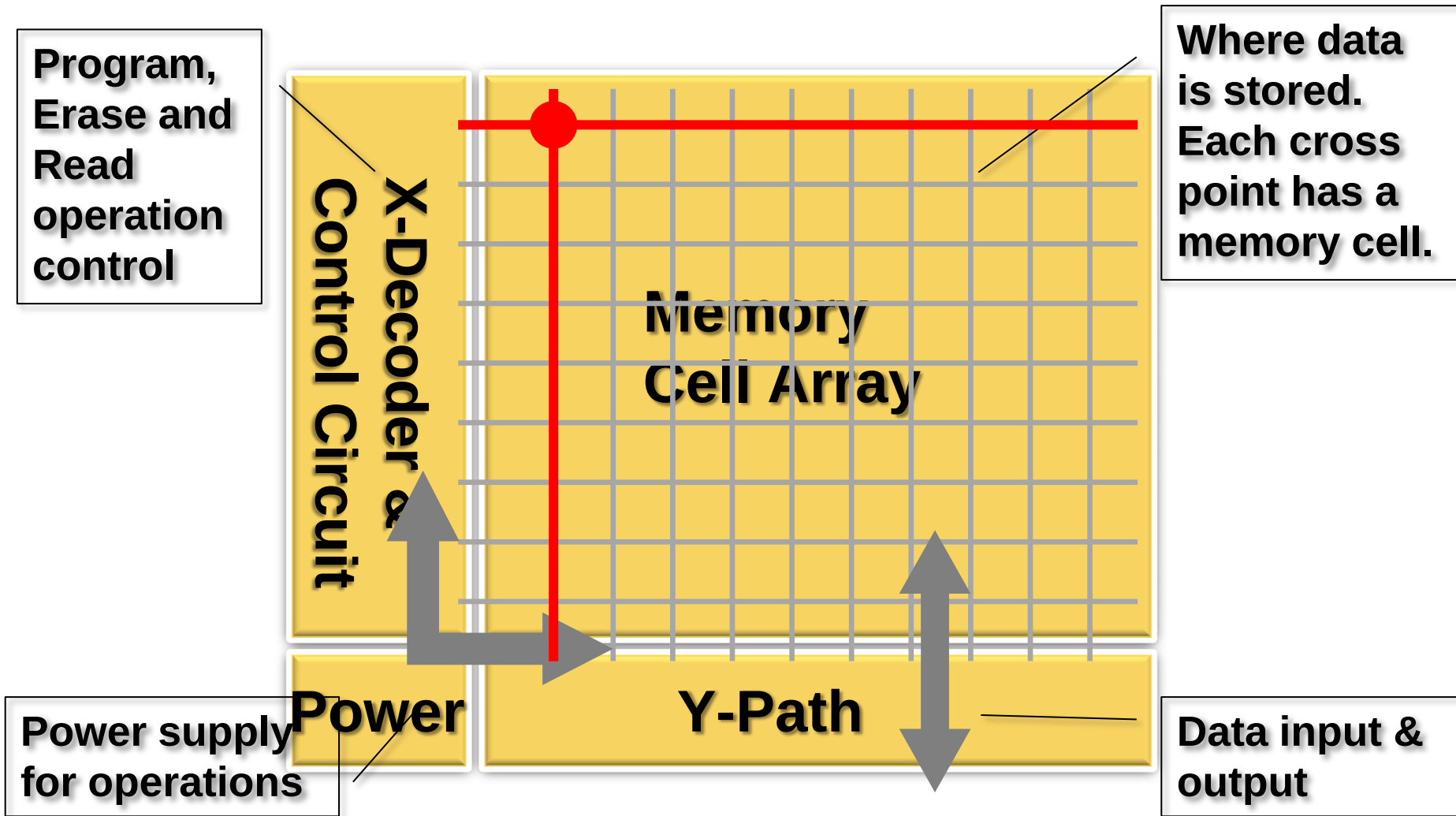
	ROM	eFuse (OTP)	Antifuse (OTP)	CMOS Floating Gate (OTP)	CMOS Floating Gate (MTP)	Embedded Flash
Cell Structure	Transistor	Poly Fuse	Antifuse	Floating Gate	Floating Gate	Floating Gate
Standard CMOS Compatible	Yes	Yes	Yes	Yes	Yes	No
Bitcell Area	< 1	50	1	2	4	1
Endurance	No	No	< 10	< 10	10K-100K	100-1000K
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

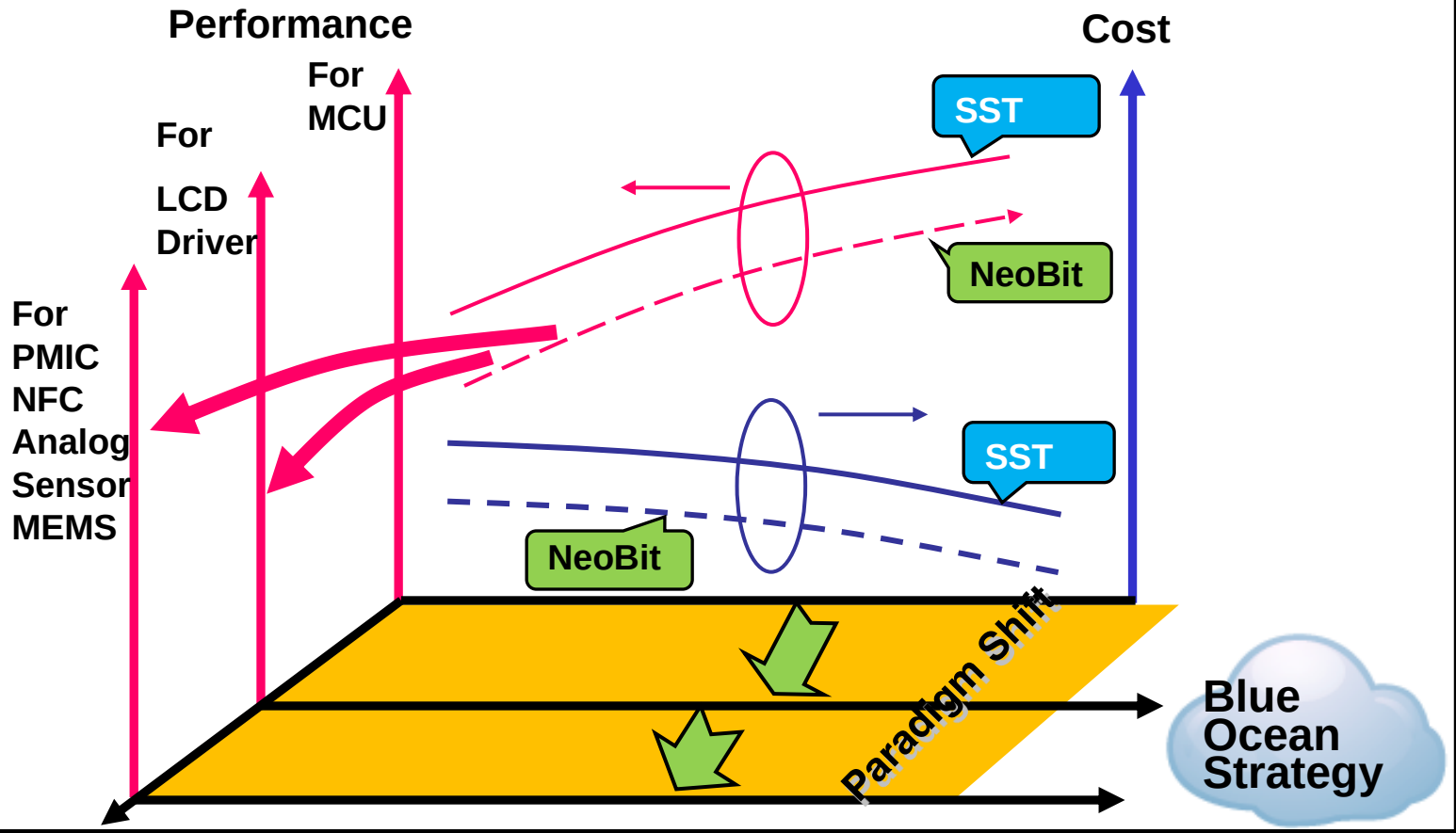


Non-Volatile Memory IP 内部

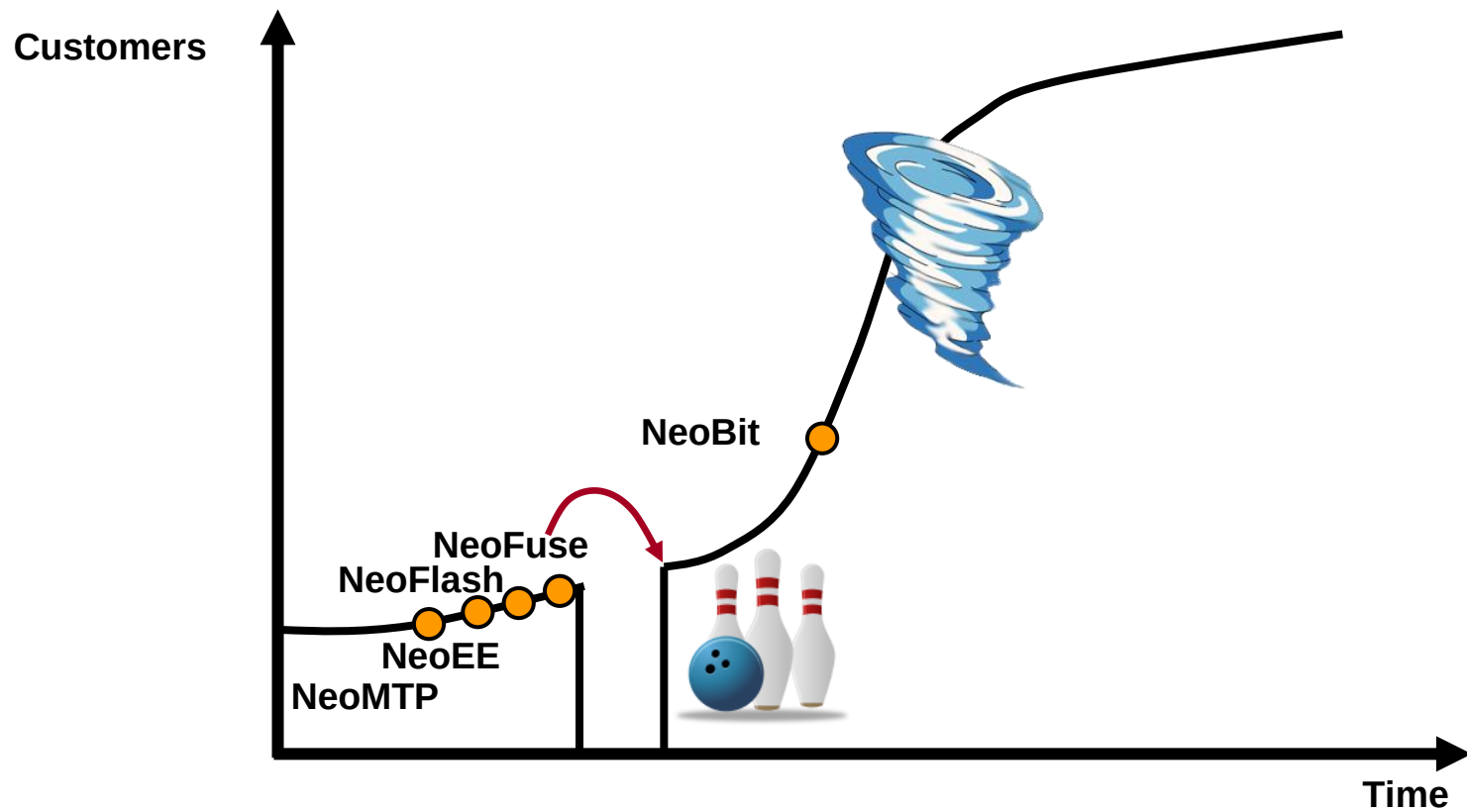


破壞性創新

● *Innovation, Innovation, and Innovation !*

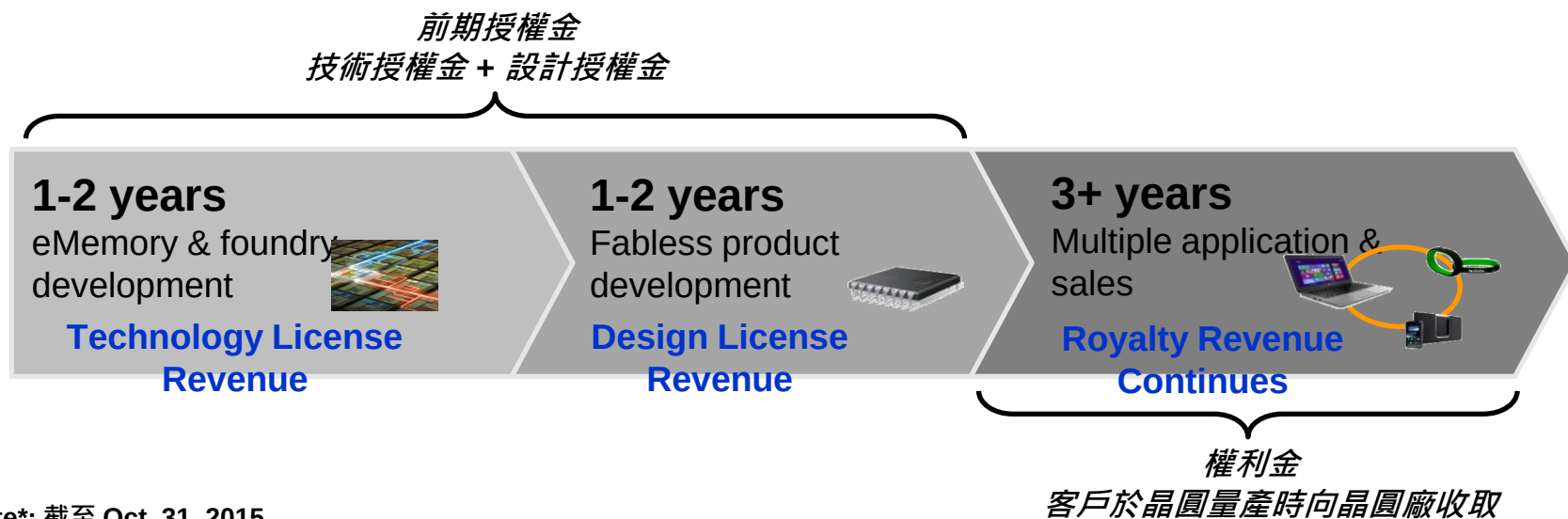


跨越鴻溝



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，155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 Oct. 31, 2015

全球客戶



Foundry



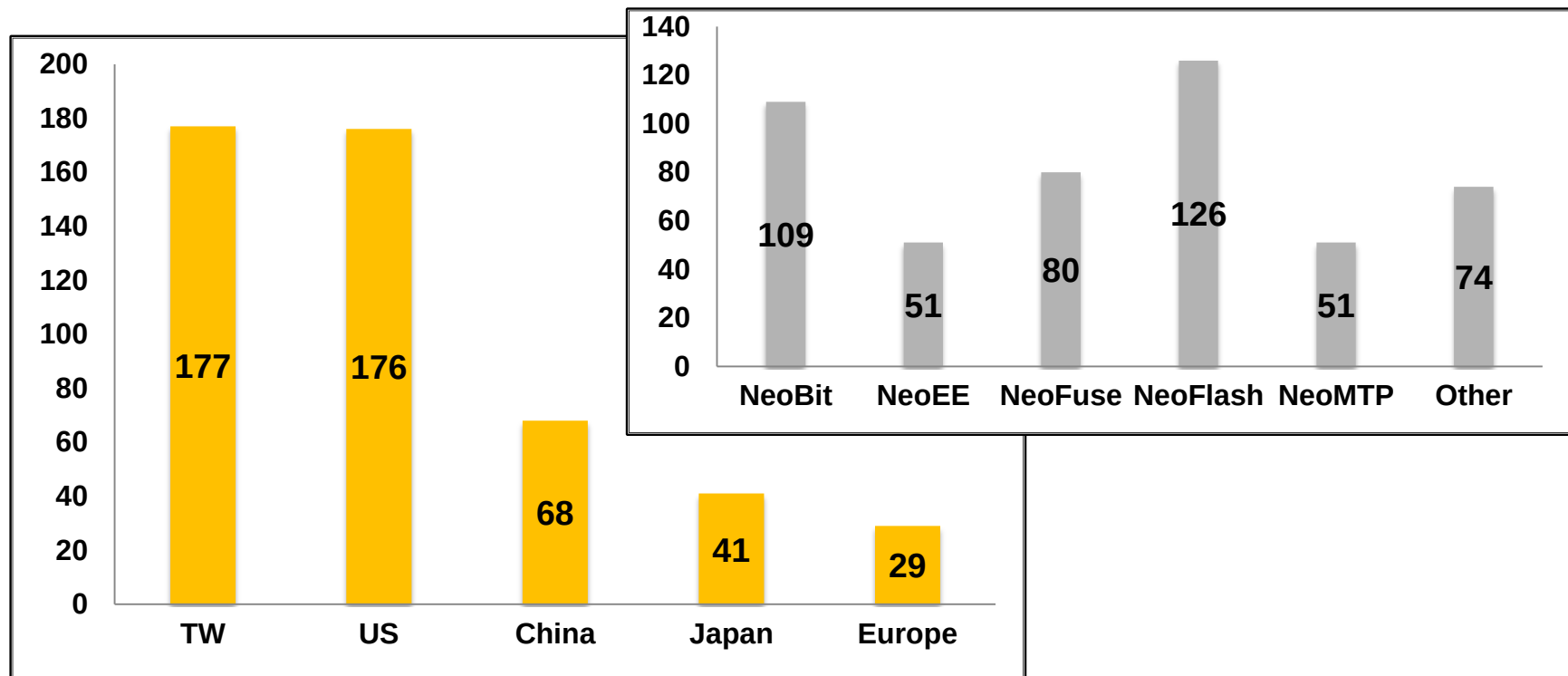
IDM



	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

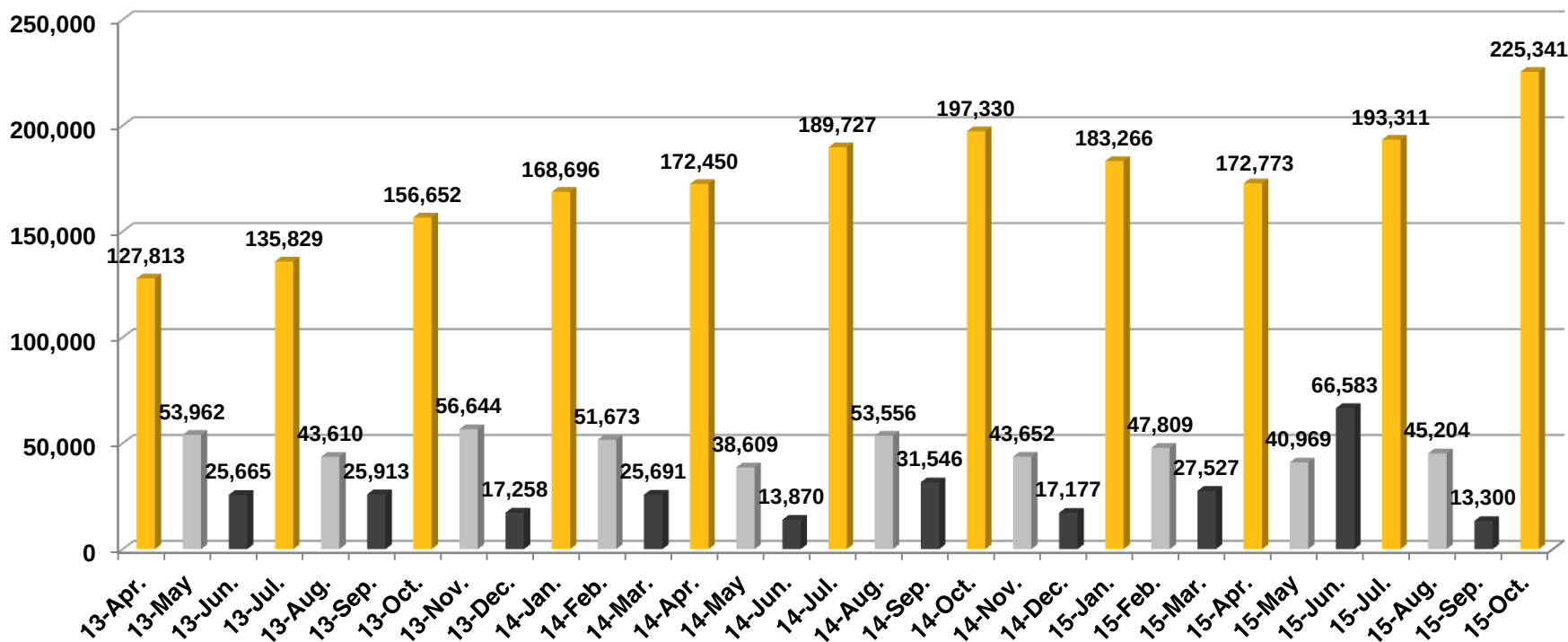
	Q215	Q315	Diff.
Pending	181	187	+6
Issued	287	304	+17
Total	468	491	+23



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

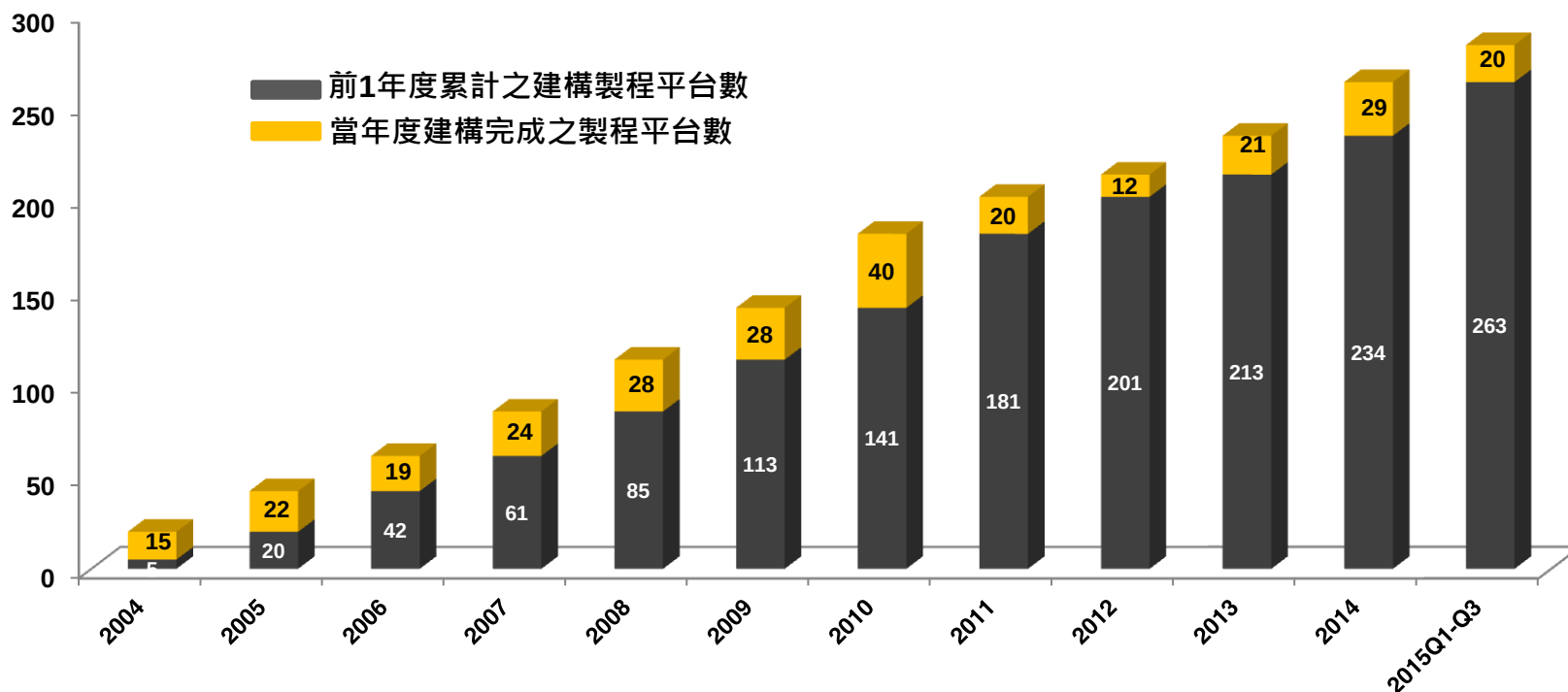
(單位:新台幣仟元)	Q315	Q215	% change	Q314	% change
營業收入淨額	251,815	280,325	-10.17%	274,829	-8.37%
營業毛利率	100%	100%	-	100%	-
營業費用	143,776	141,435	1.66%	135,695	5.96%
營業淨利率	42.9%	49.5%	-6.6ppts	50.6%	-7.7ppts
本期淨利	106,301	130,297	-18.42%	124,352	-14.52%
純益率	42.2%	46.5%	-4.3ppts	45.2%	-3.0ppts
每股盈餘 (單位: 新台幣元)	1.40	1.72	-18.60%	1.64	-14.63%
權益報酬率	24.5%	30.9%	-6.4ppts	29.7%	-5.2ppts

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 Sep.) : **83***
- **17** for NeoBit, **28** for NeoFuse, **23** for NeoEE, and **15** for NeoMTP.

	14/16nm	28nm	40nm	55/65nm	80/90nm	0.11~ 0.13um	0.15~ 0.18um	>0.25 um	Total
NeoBit	-	-	-	-	-	5	11	1	17
NeoFuse	2	6	4	8	2	4	2	-	28
NeoFlash	-	-	-	-	-	-	-	-	-
NeoEE	-	-	2	-	1	6	14	-	23
NeoMTP	-	-	1	1	2	3	8	-	15

Note*: 5 platforms qualified in Q3, 4 platforms kicked off in Q3

目前正在建構的技術製程平台

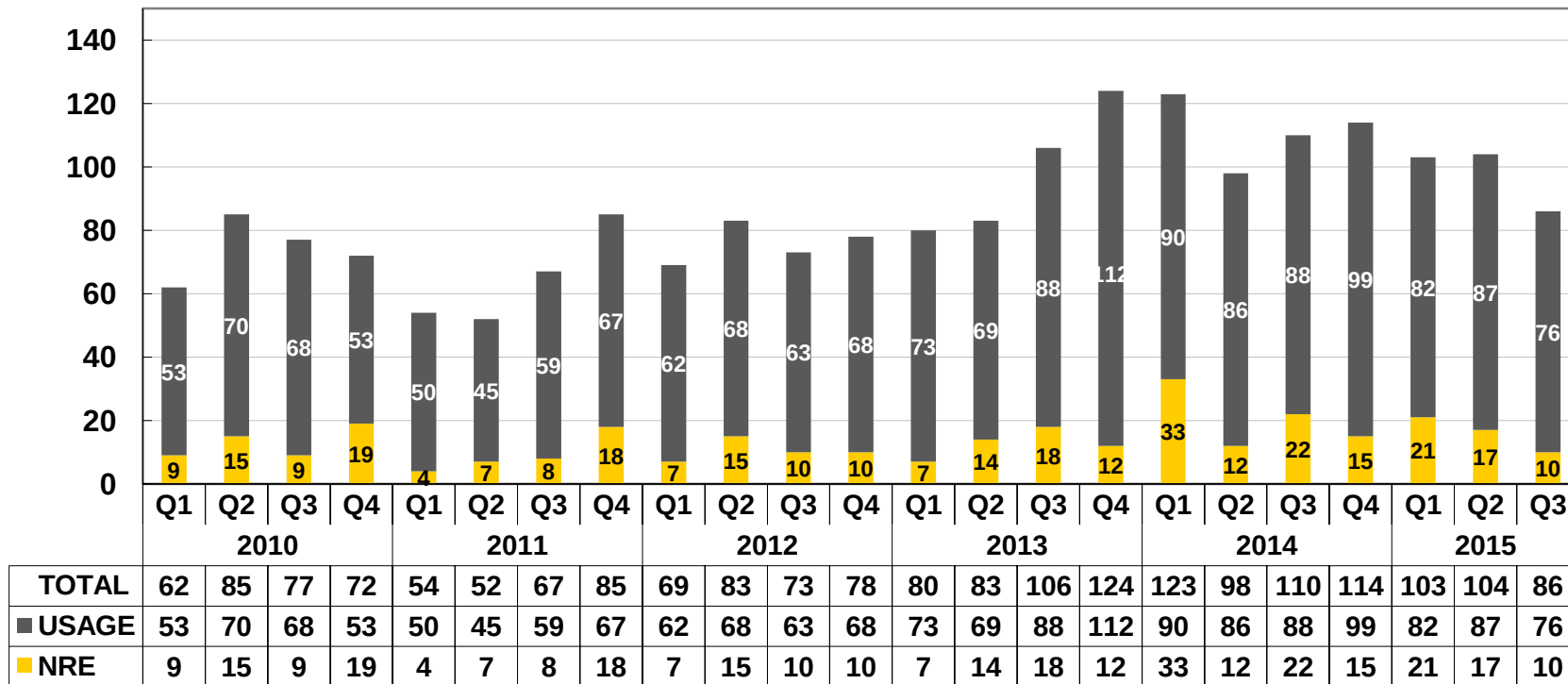
12" Fabs	Production	Development	NVM Type	Process Type
16nm	0	2	OTP	FF+
28nm	4	6	OTP	LP/HPM, HLP/HPM, LPS
40nm	2	7	OTP, MTP	HV-DDI, LP
55/65nm	10	9	OTP, MTP, Flash	LP, HV-DDI, HV-OLED, DRAM, CIS
80/90nm	5	5	OTP, MTP	HV-DDI, HV-OLED, LP
0.13/0.11um	6	4	OTP, Flash	HV-DDI, BCD, Generic
0.18um	1	0	OTP	BCD

8" Fabs	Development	NVM Type	Process Type
0.13/0.11um	14	OTP, MTP, Flash	HV-DDI, BCD, LP, RF, CIS, LL
0.18/0.16/0.152um	35	OTP, MTP	Generic, LP, LL, MR, HV, Green, BCD
0.25um	1	OTP, MTP	BCD
0.35um	0	OTP	UHV

*As of Sep. 30, 2015

每季設計授權數(New Tape Out)

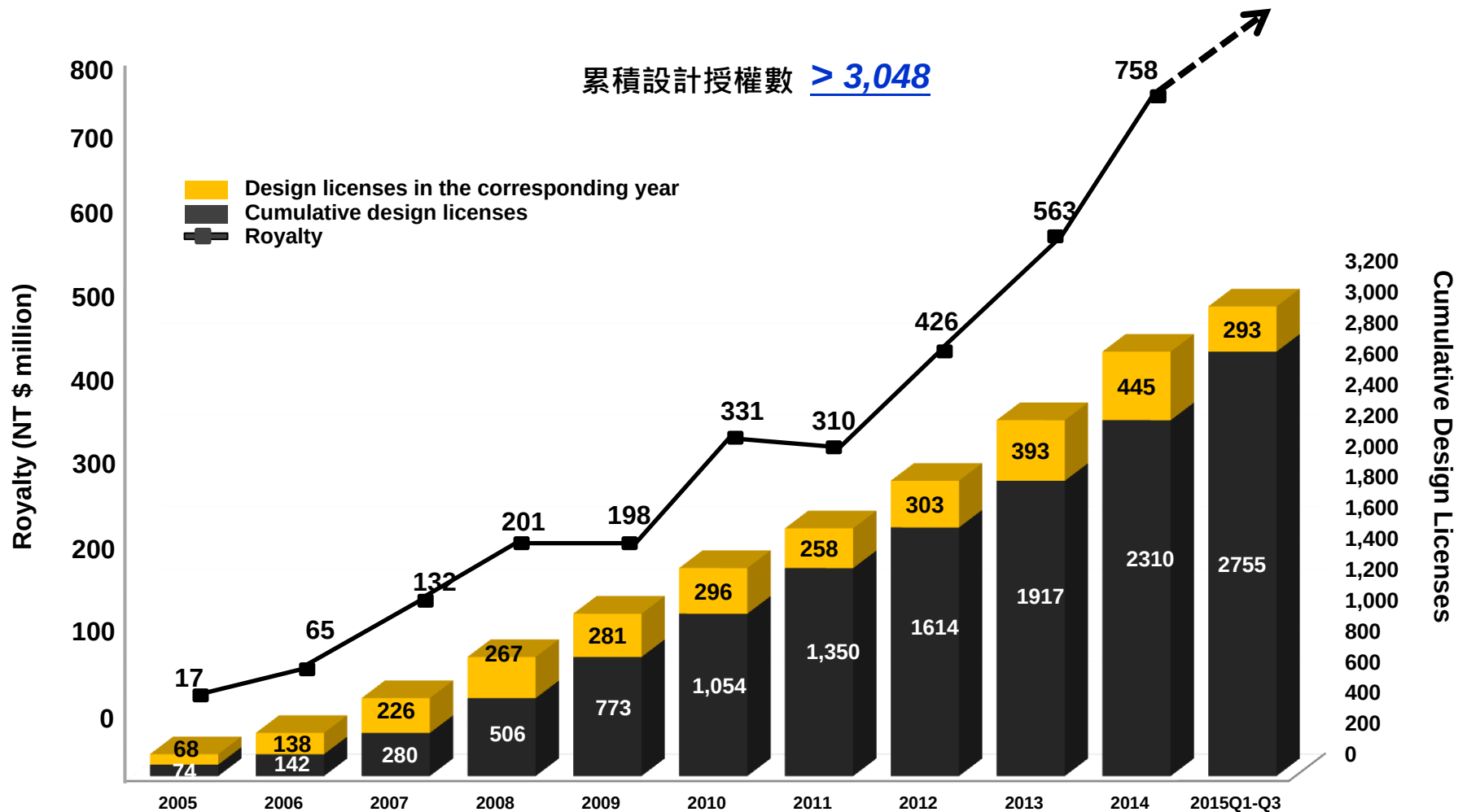
- Total **293** NTO as of Q3 2015 (**445**@2014 **393**@2013, **303**@2012, **258**@2011)



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

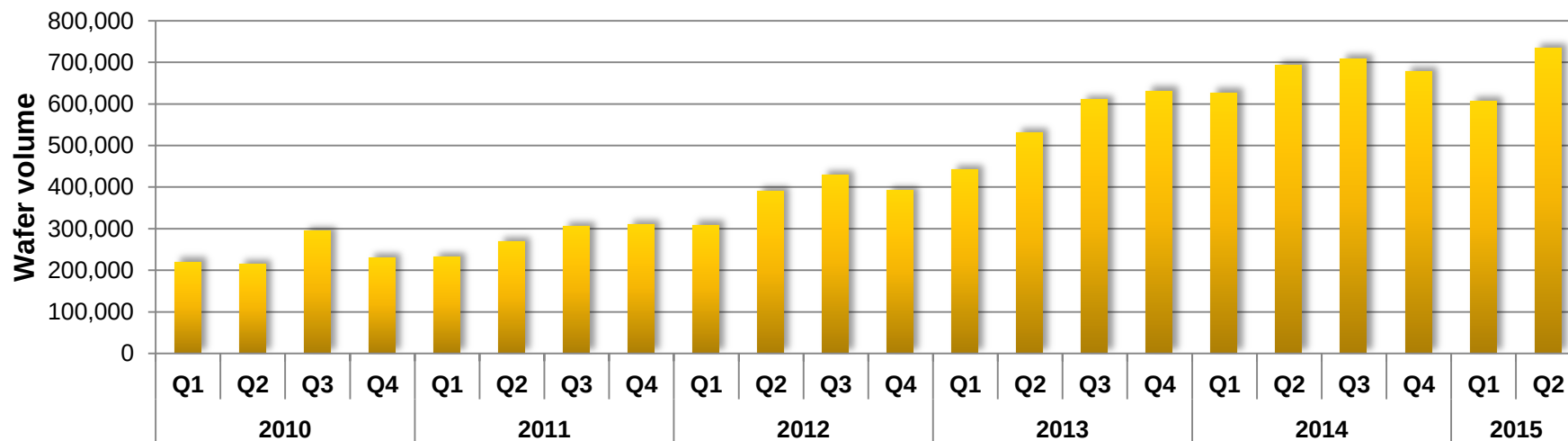


註1. 2009年因整體半導體景氣衰退，權利金年衰退1.5%。

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 Q315

	Process node	*% of T	Q315	Q215	2014	2013
8"	0.25/0.35	4%	38.2%	34.4%	30.5%	27.3%
	0.15/0.18	13%	7.9%	8.9%	11.9%	10.7%
	0.11/0.13	3%	30.9%	17.0%	20.8%	19.1%
12"	90nm	7%	21.8%	19.2%	16.3%	4.8%
	65nm	11%	0.9%	0.4%	0%	0%
	40/45nm	14%	0%	0%	0%	0%
	28nm	27%	0.02%	0.01%	0%	0%
	20nm	20%	0%	0%	0%	0%
8"		21%	16.3%	14.5%	15.6%	14.2%
12"		79%	2.3%	1.8%	1.4%	0.69%
Total		100%	5.0%	4.5%	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

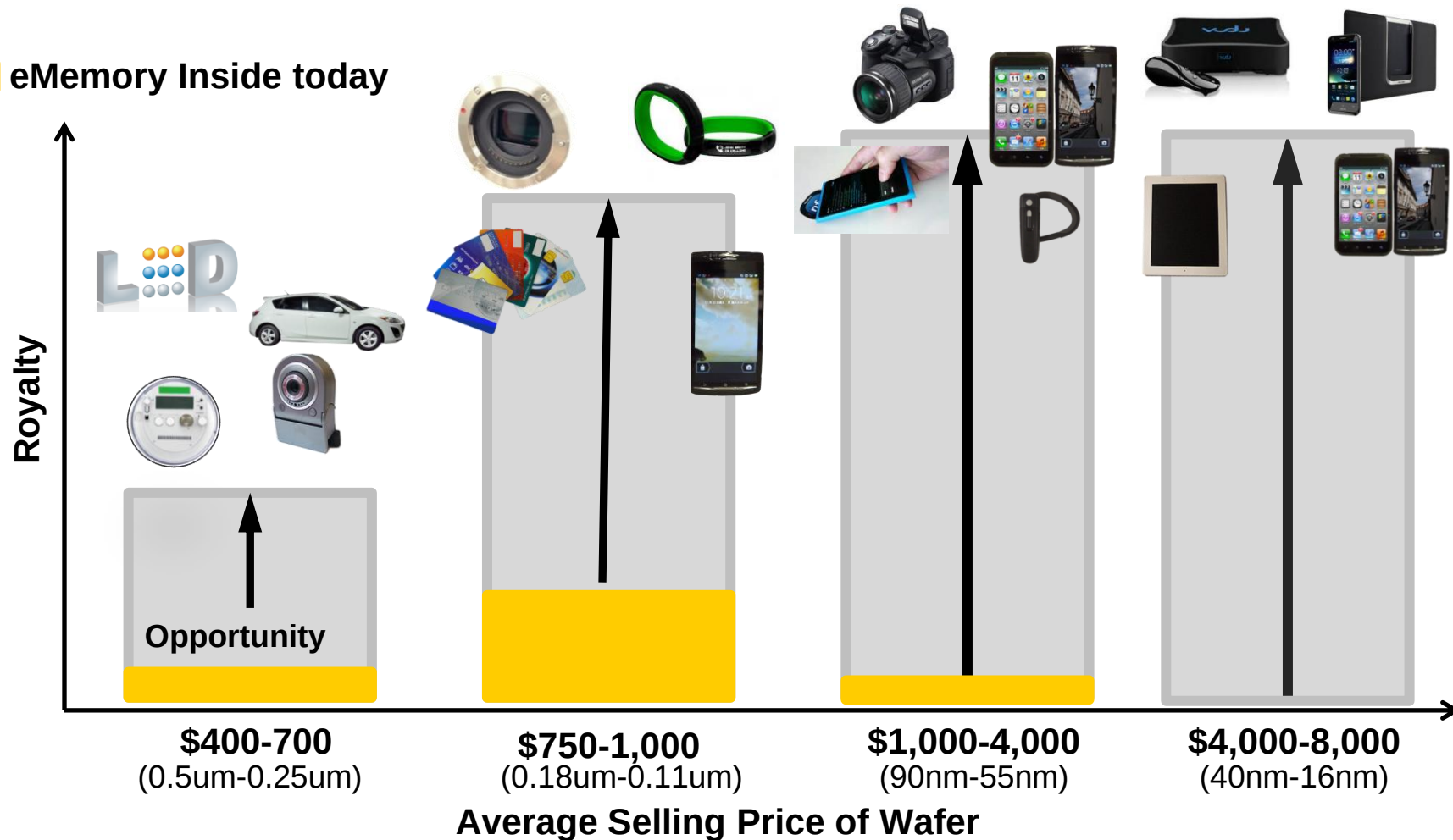
NeoFlash

NeoEE

NeoMTP

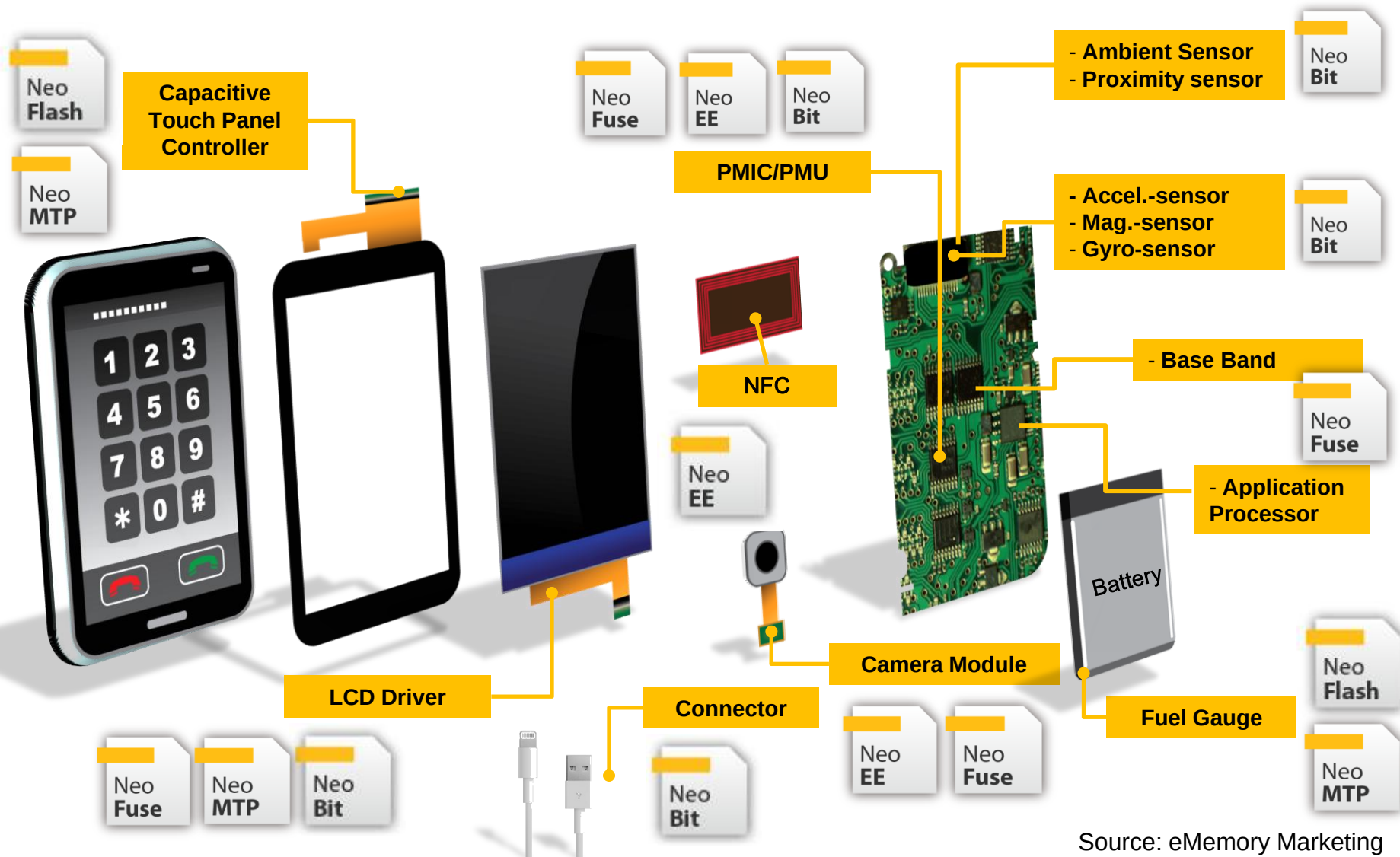
商機與潛力

 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

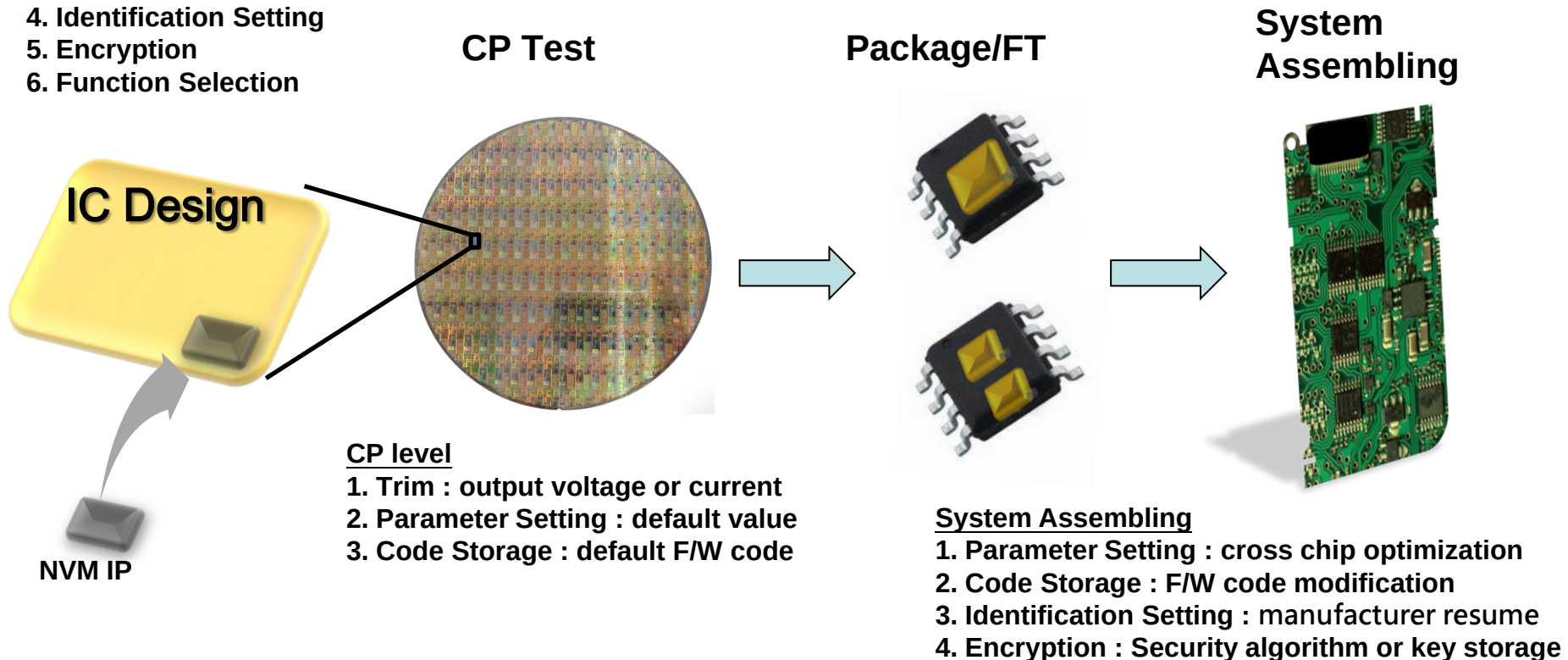
Benefits from Using eMemory IPs

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



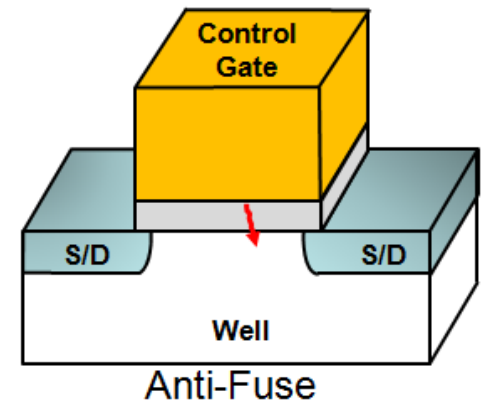
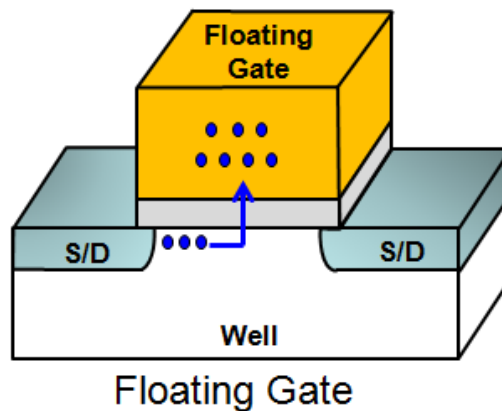
高機密性的安全設定

- 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



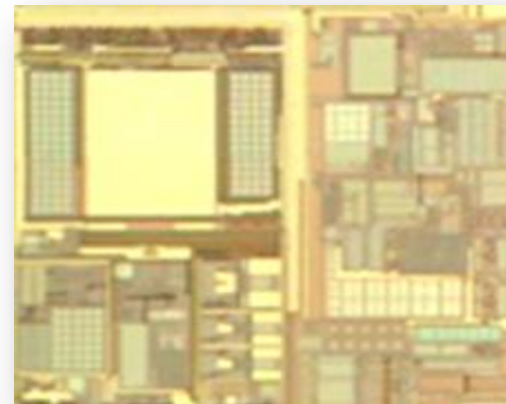
reverse
copy

re-produce



without protection

Fake Product

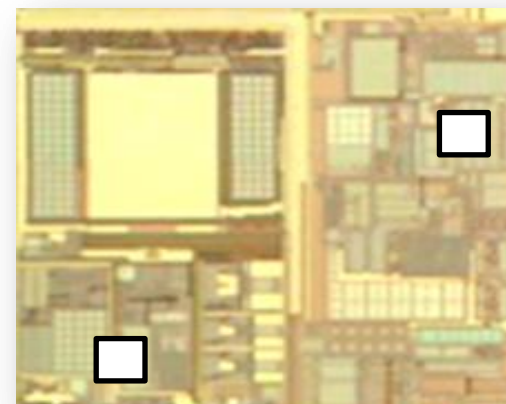


reverse
copy

re-produce



with protection



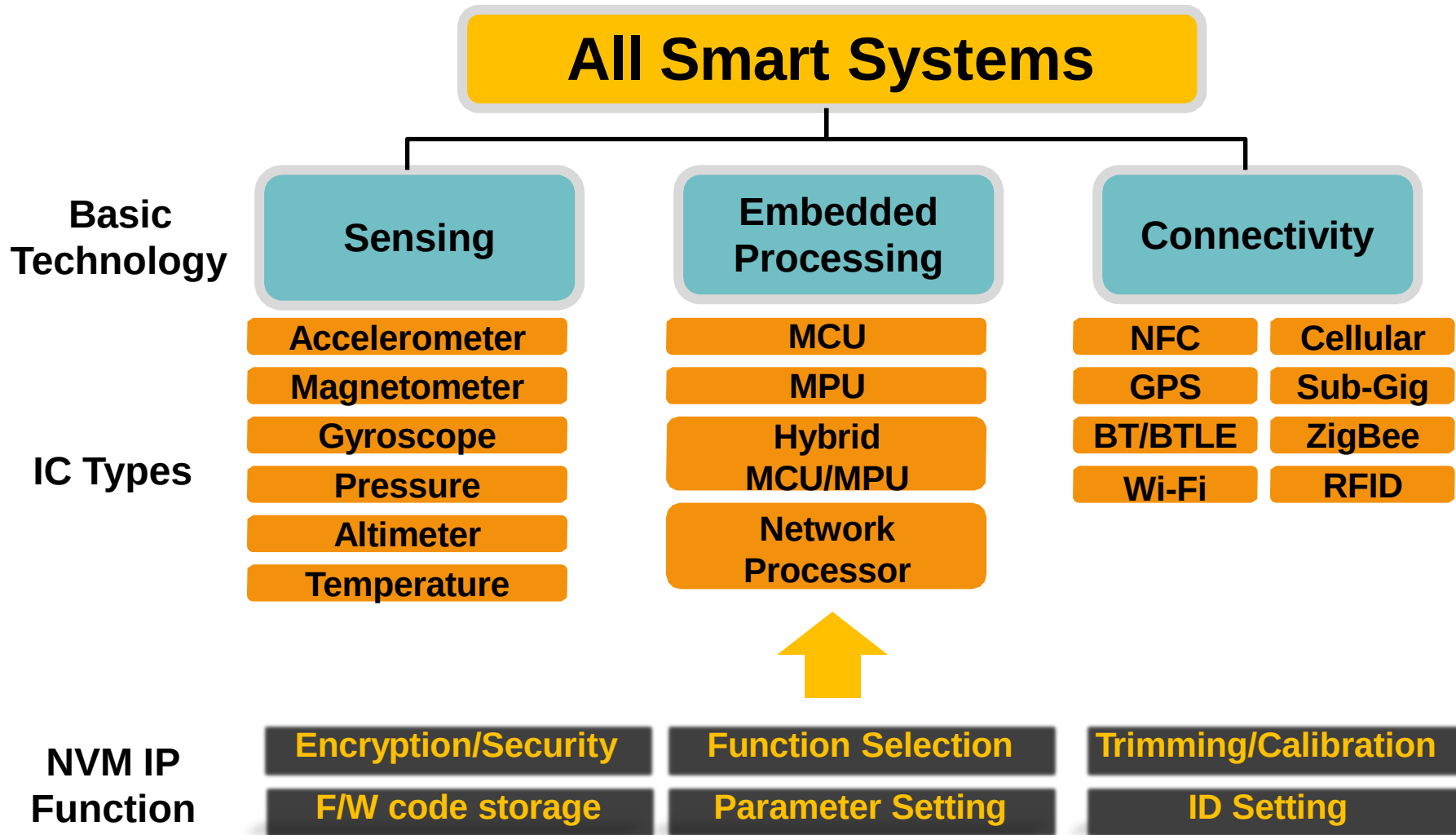
**Security IP/Code by
Authorized Use**

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

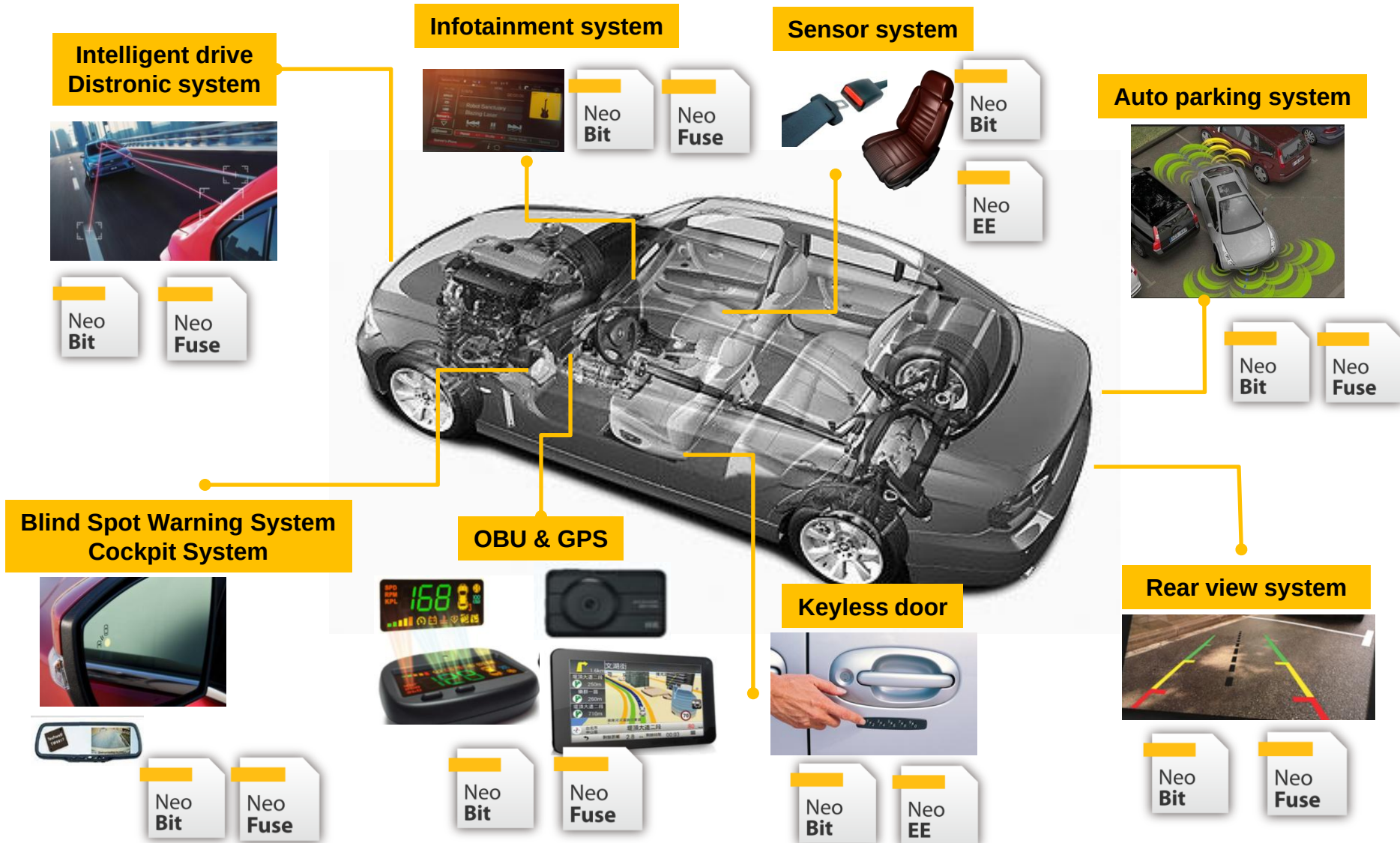
力旺矽智財引領高安全性應用



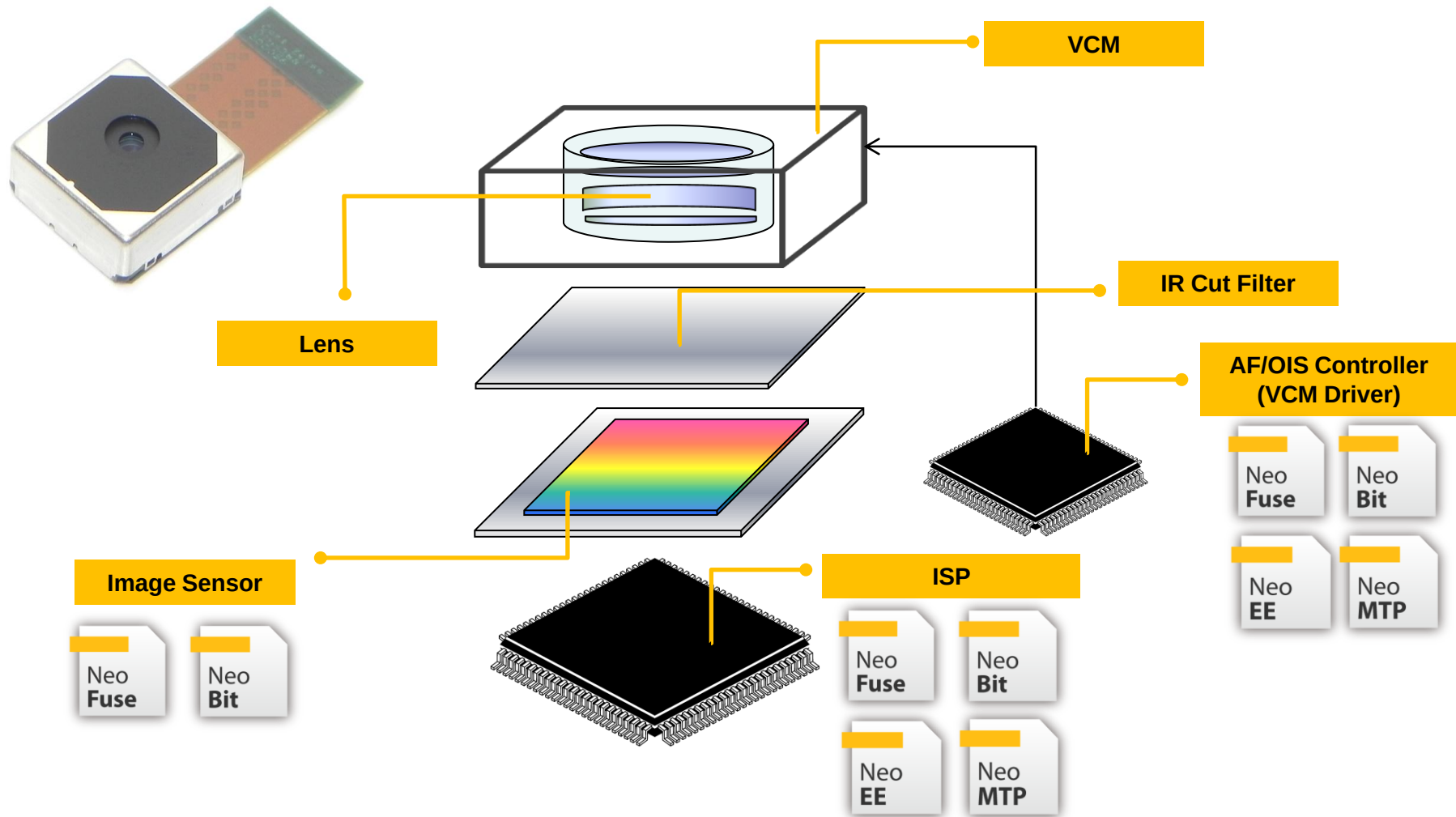
在IoT中之NVM IP 需求



Autotronics with eMemory IPs



Imager Module with eMemory IPs



先進液晶顯示驅動晶片

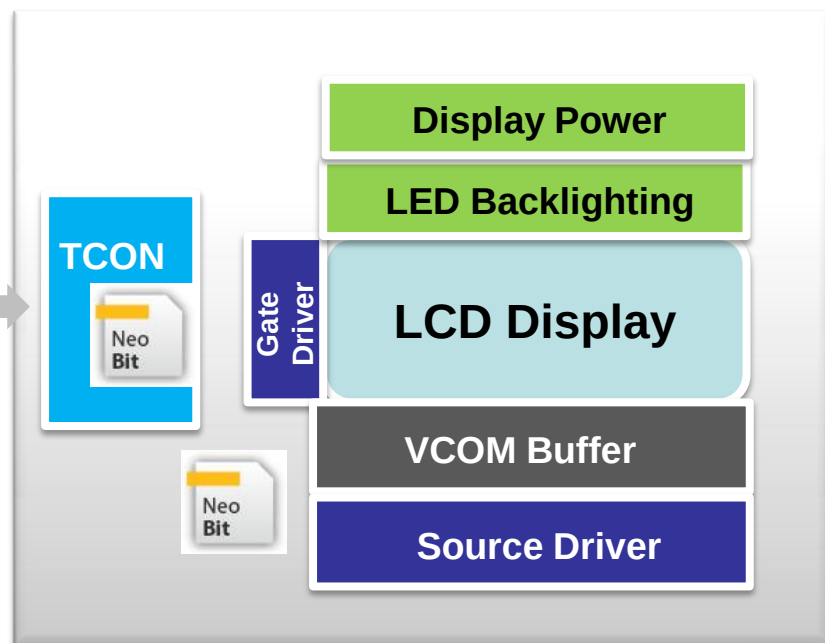
Process Technology : 0.11um HV/80nm HV/55nm HV



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



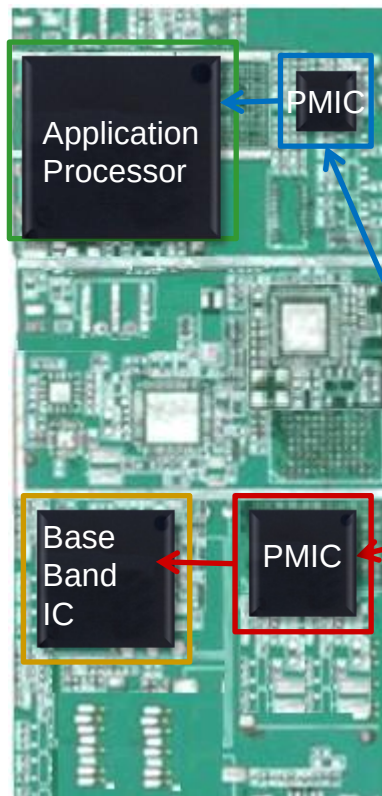
DDI



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

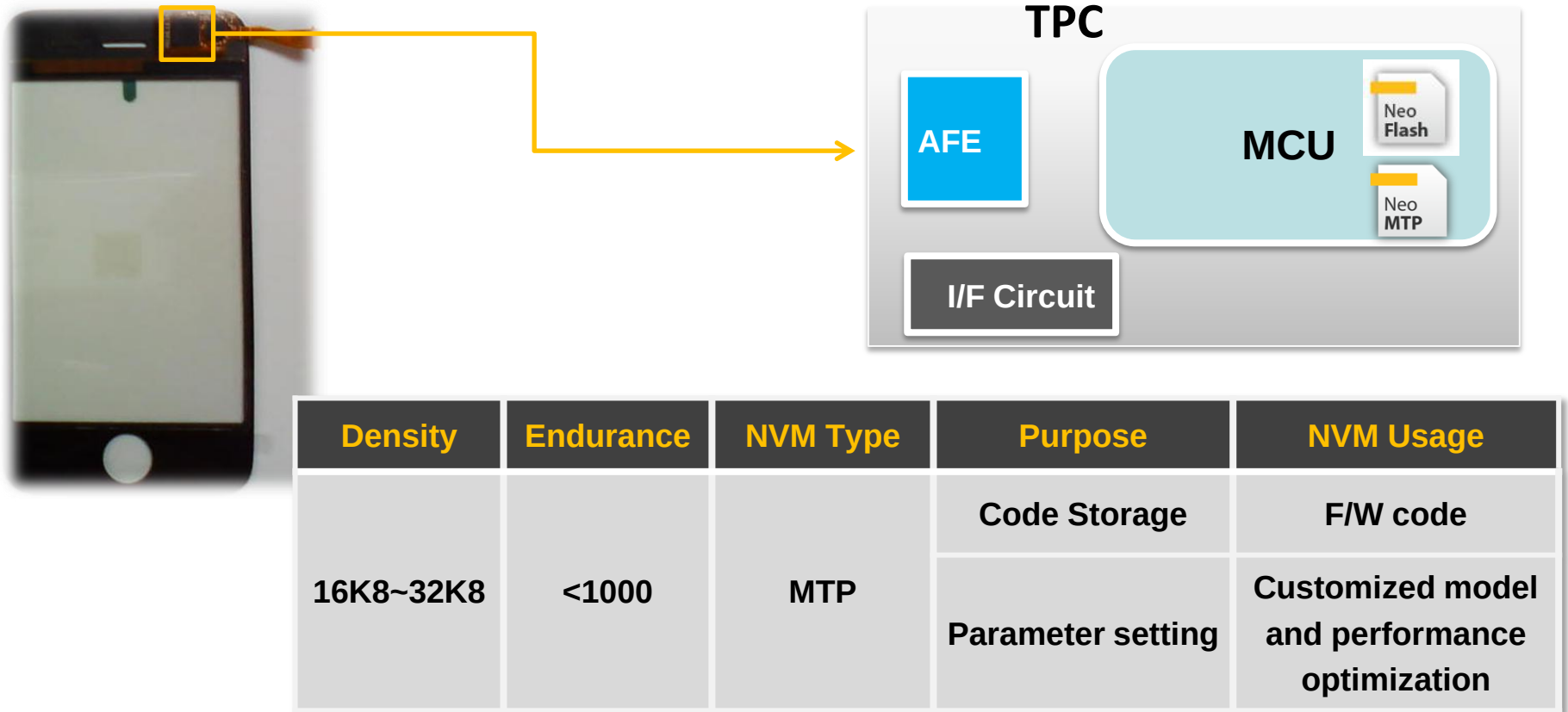


Density	NVM Type	Purpose	NVM Usage
2Kb~4Kb	OTP	Trimming	DC/DC, Bandgap
		Parameter Setting	Design flexibility & Performance optimization
		Code Storage	Start-up behavior & smart power saving algorithm



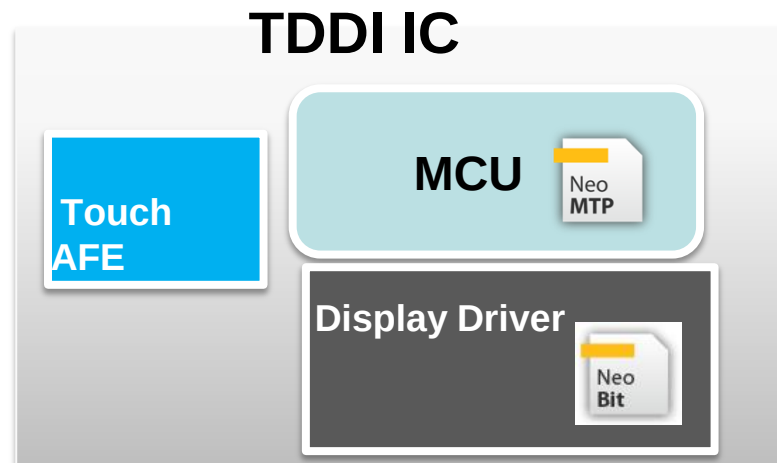
觸控面板控制器晶片

Process Technology : 0.16um HV/0.11um G



內嵌式觸控面板控制器晶片

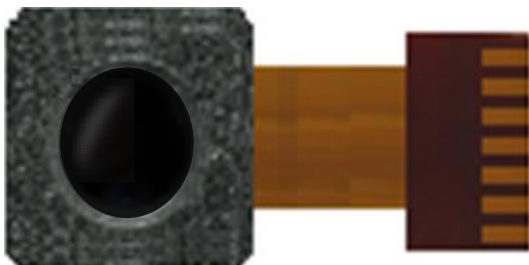
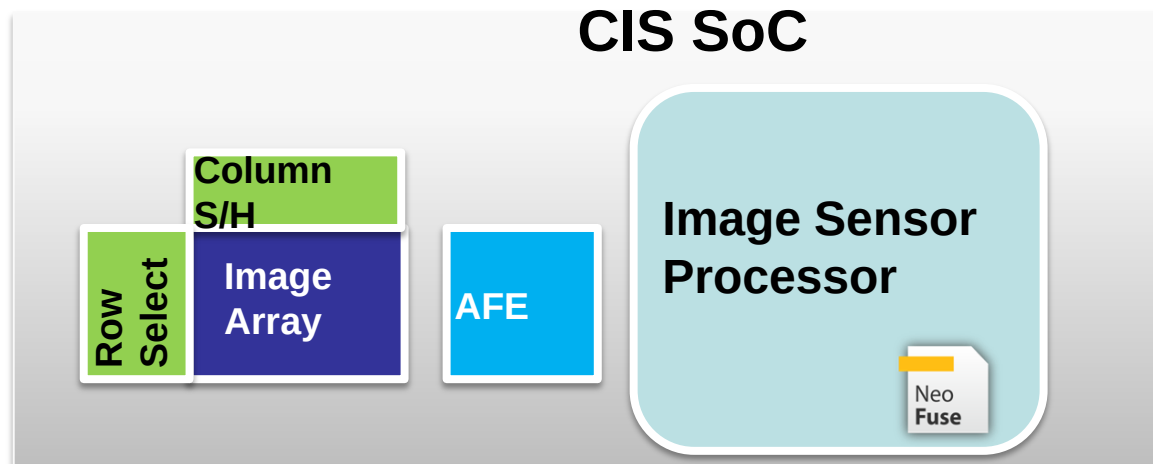
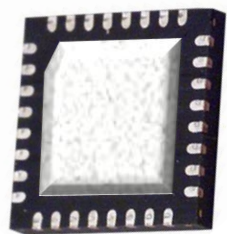
Process Technology : 0.11um HV/80nm HV/55nm HV



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

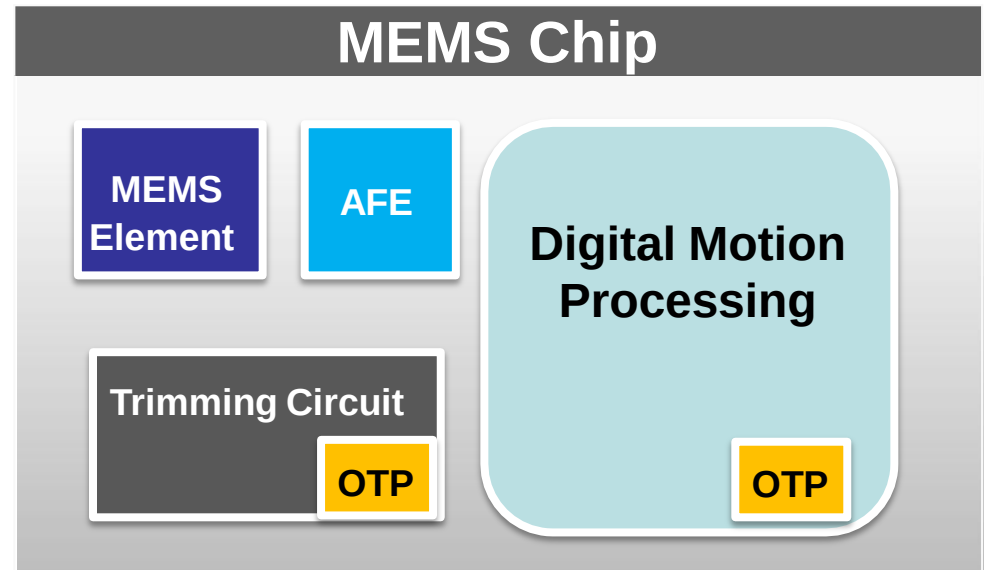
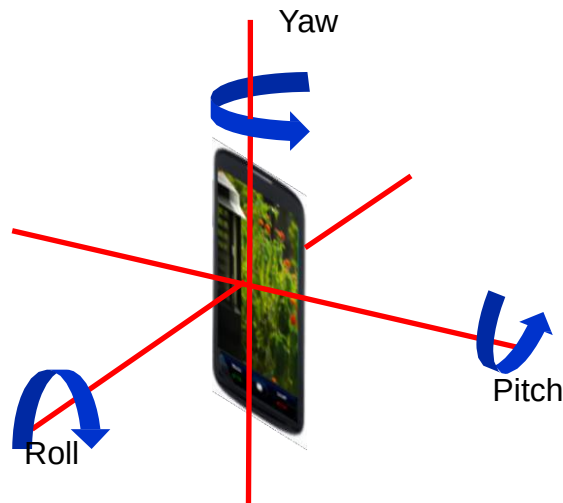
Process Technology : 0.11um CIS/90nm CIS/65nm CIS



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

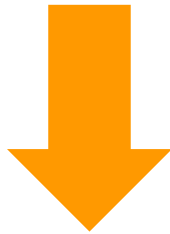


Density	NVM Type	Purpose	NVM Usage
2Kb~4Kb	OTP	Trimming	Factory trimming
		Parameter Setting	Signal filtering
		Code Storage	Geometric computation

取代嵌入式快閃記憶體之競爭優勢

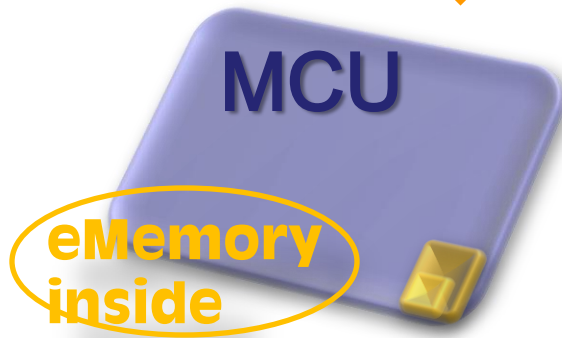


product design & manufacturing by
embedded Flash
Logic Process + 10 Masks



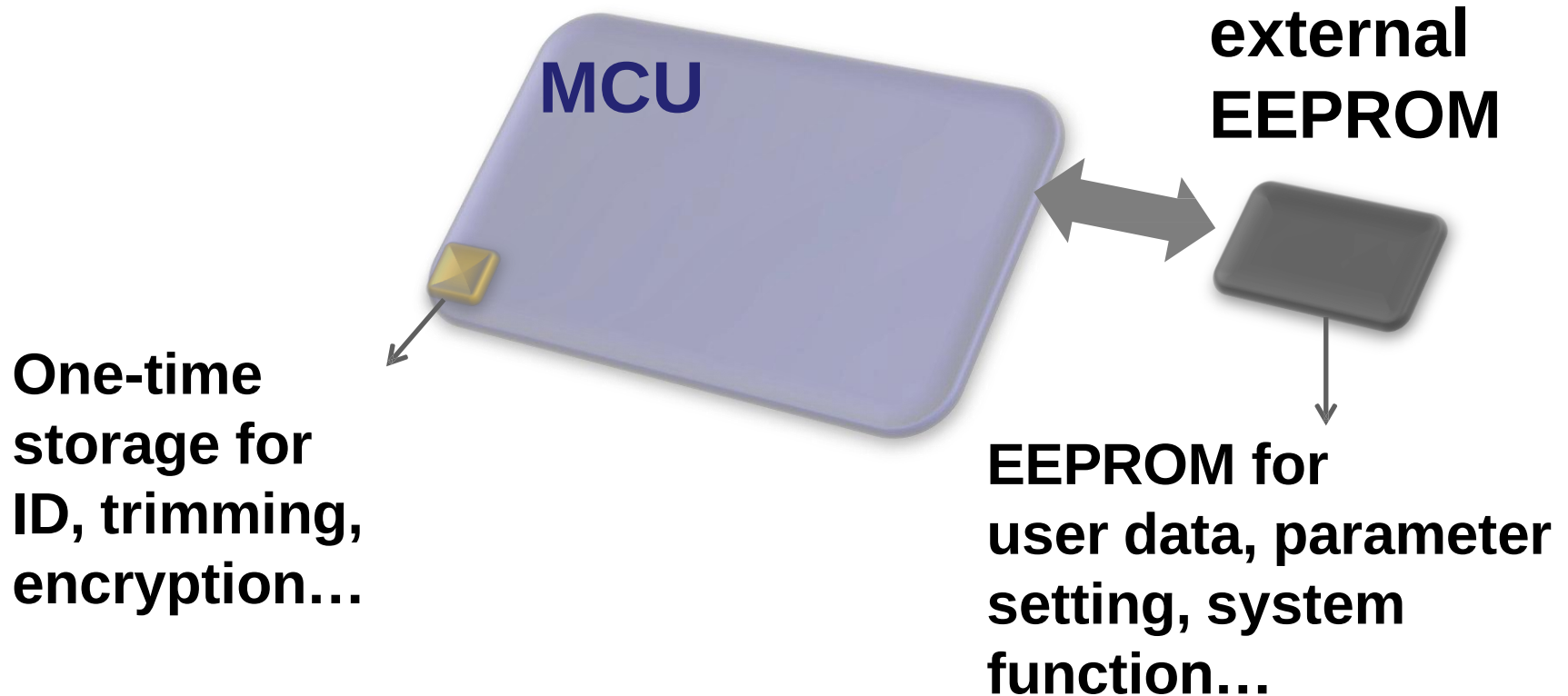
***30% more
cost reduction***

***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	Equa to 8-inch wafer (K)
AP	5740
PMU	5255
Base Band controller	2945
Smart card controller	2683
Fingerprint	2500
CIS sensor	2215
LCD driver (int with TCON)	1955
Gauge IC	708
TV controller	619
Touch panel controller (C)	602
Connectivity	463
STB controller	348
DC-DC/AC-DC	239
Wifi controller	231
Accelerator sensor controller	166
LED driver	140
Light snesor	126
Gyroscope sensor controller	120
BT controller	107
TAG IC	104
MCU (8bits, LV/3.3V)	90
MCU (8bits, pure 5V)	88
ISP	82
DVD controller	67
P-Gamma	47
NB CAM controller	38
Pressure sensor controller	23
Touch pad controller	16
PC CAM controller	14
Touch panel controller (R)	3
TCON (w/o driver)	3
Speech controller	0

2015 Q3 updated

未來展望

- 幾個大型授權案已進入最後協商，授權金可望對營收貢獻相當幅度的成長。
- 美國及中國手機大廠的PMIC持續擴大量產，並導入其他之電源管理應用。
- 高階DDI 產量持續擴大，客戶也規劃往更先進之製程發展。
- 28nm Set-top box處理器之客戶已順利量產，原有客戶持續tape-out，且開始滲透至其他相關廠商。
- Fingerprint 及CIS 客戶持續tape-out，量產權利金因為客戶改版，預計明年發酵。
- 16nm FF⁺驗證成功，目前進行最後可靠度測試，預計明年上半年客戶可導入應用。
- 車用電子已經tape-out，目前除歐洲最大車用電子廠商開始導入外，亦準備進入日系車用電子廠。

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.

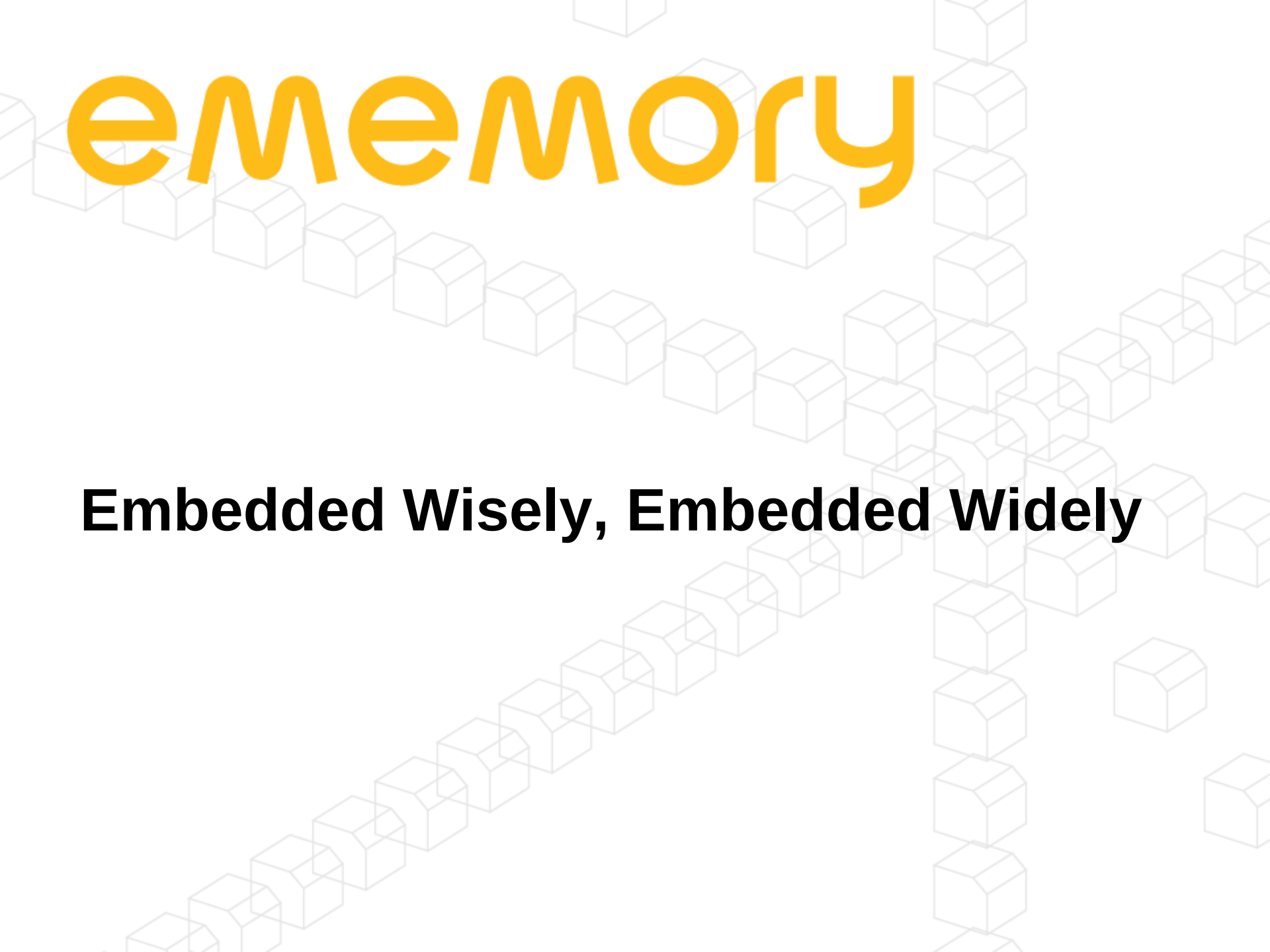
Growth in advanced technology

- 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