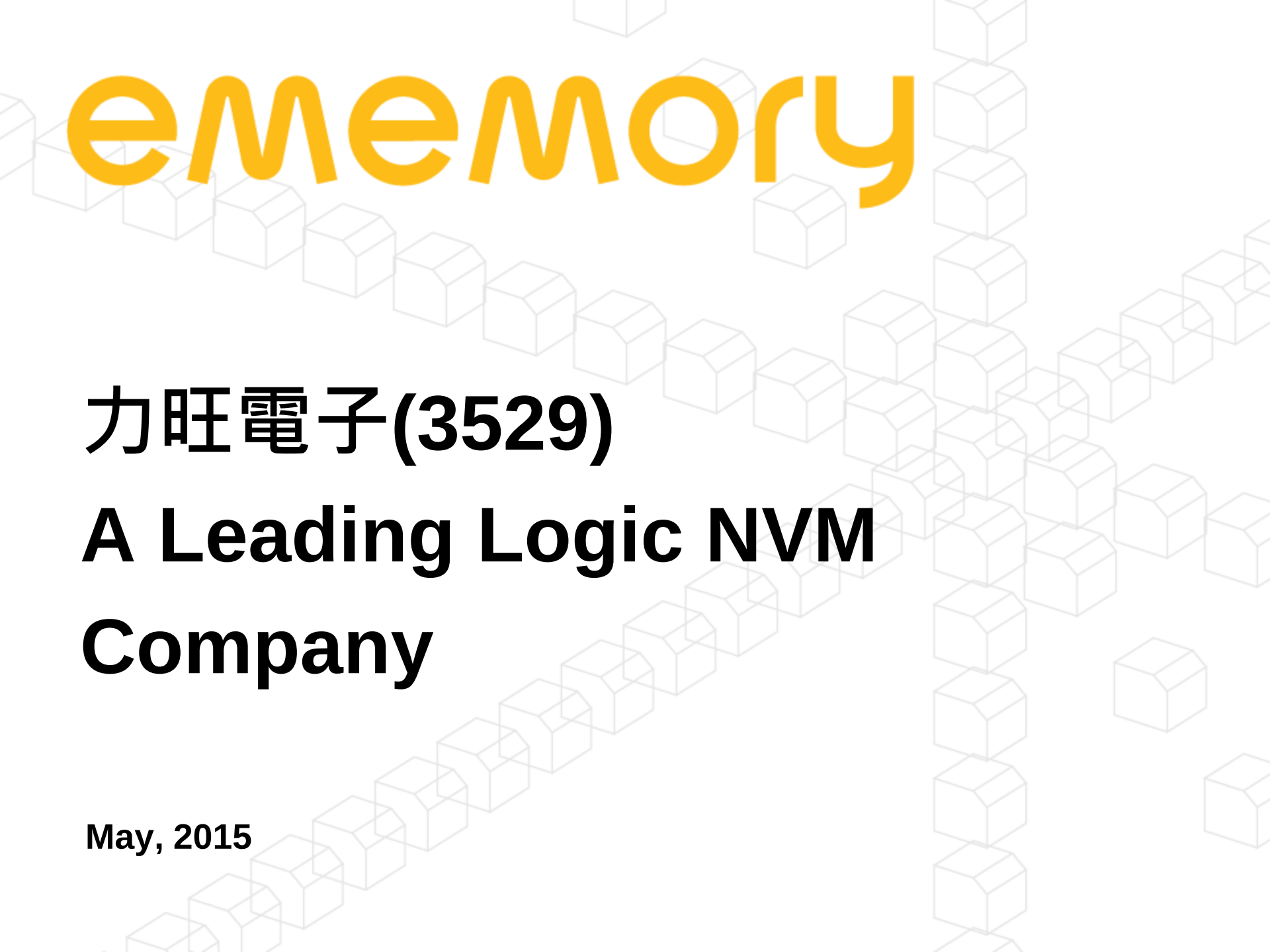




ememory

力旺電子(3529)

**A Leading Logic NVM
Company**

May, 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。

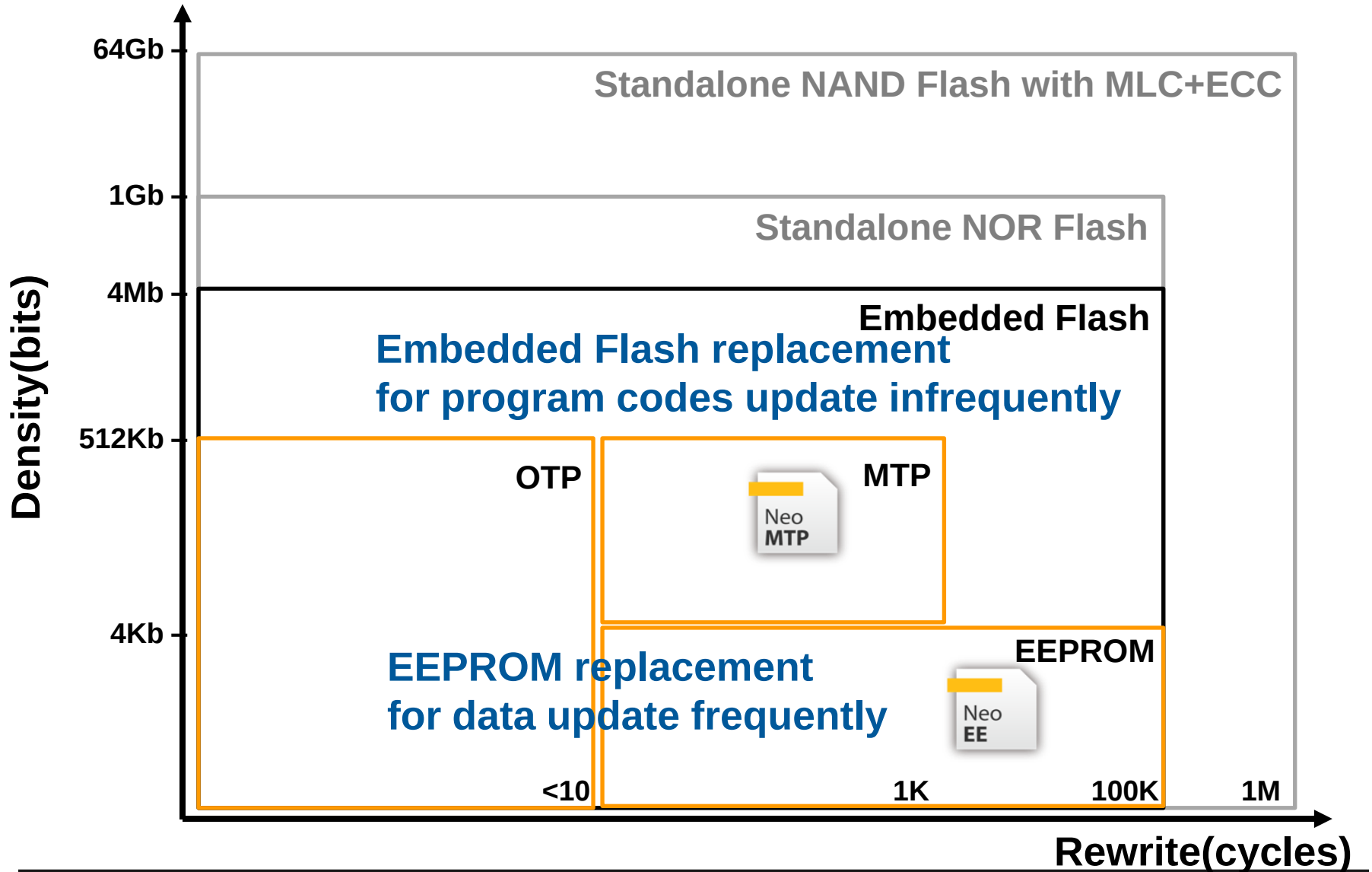
投資安全聲明

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

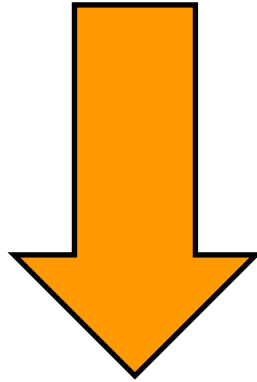
- 公司營運模式
- 營運回顧
- 成長機會與未來展望
- 問題與回答

嵌入式非揮發性記憶體分類



何謂 Logic Non-Volatile Memory

Embedded NVM = LOGIC + 10 Masks



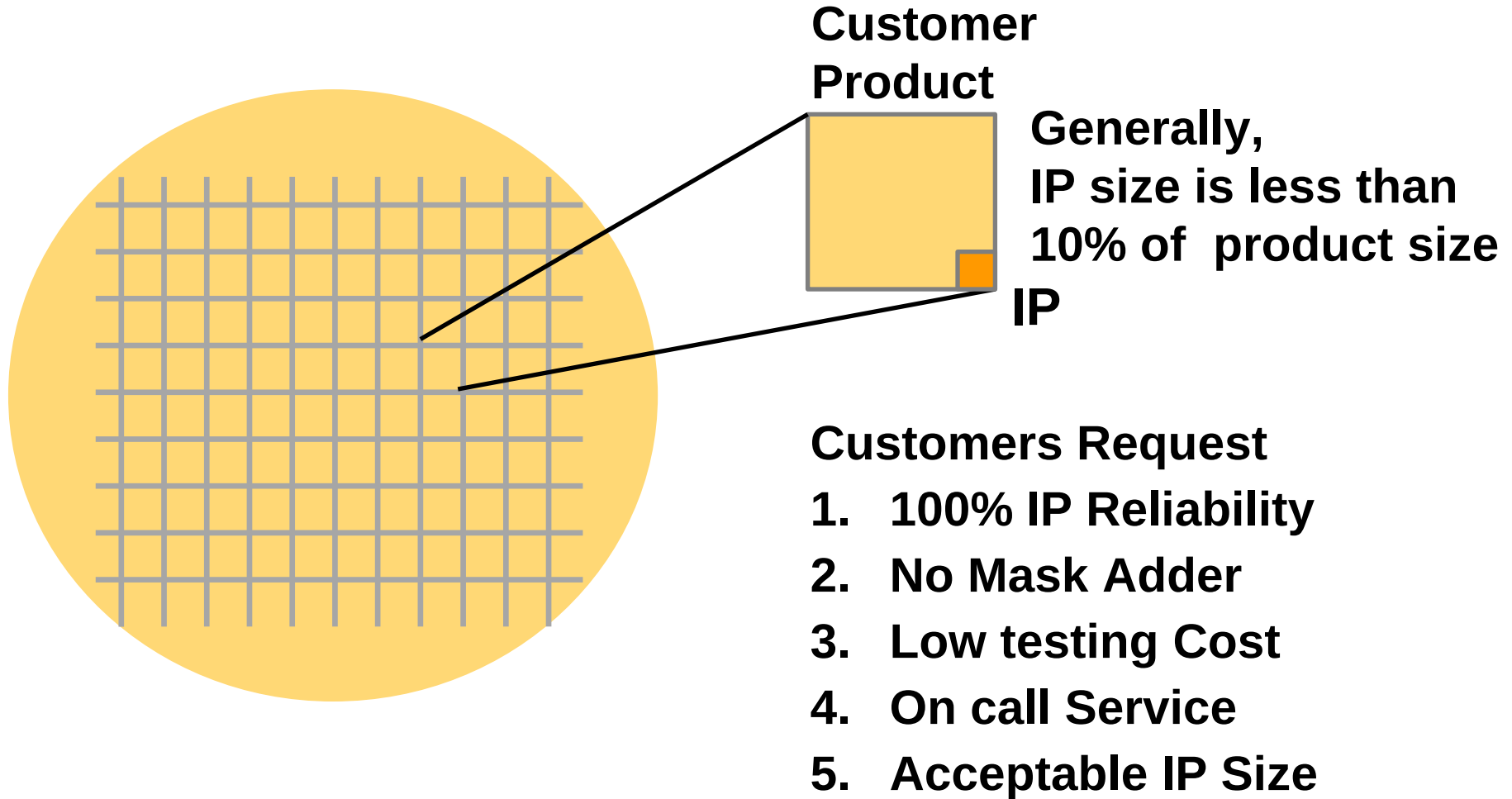
*30% more
cost reduction*

Embedded LOGIC NVM = LOGIC

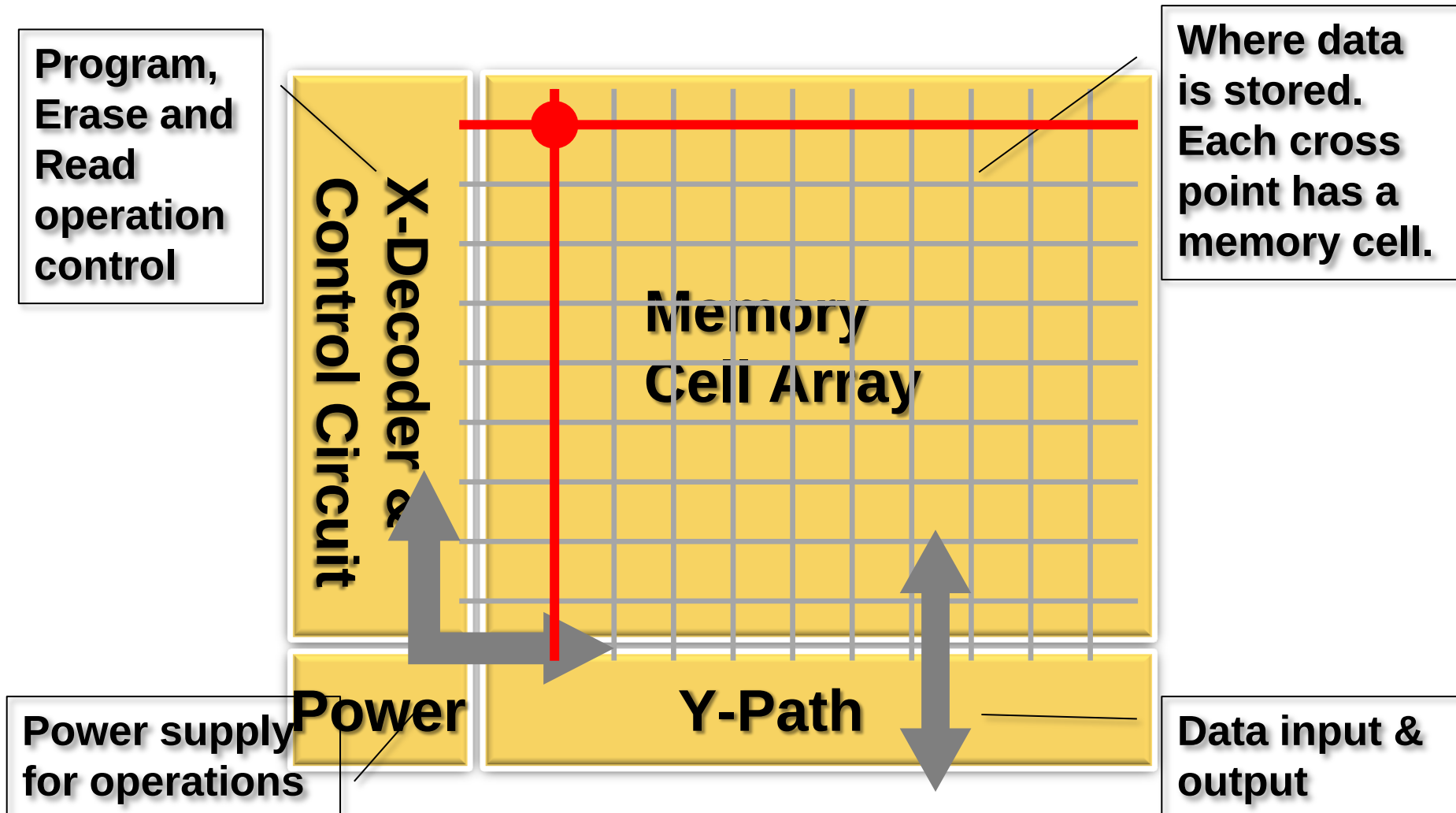
嵌入式非揮發性記憶體技術

	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

採用IP之考量

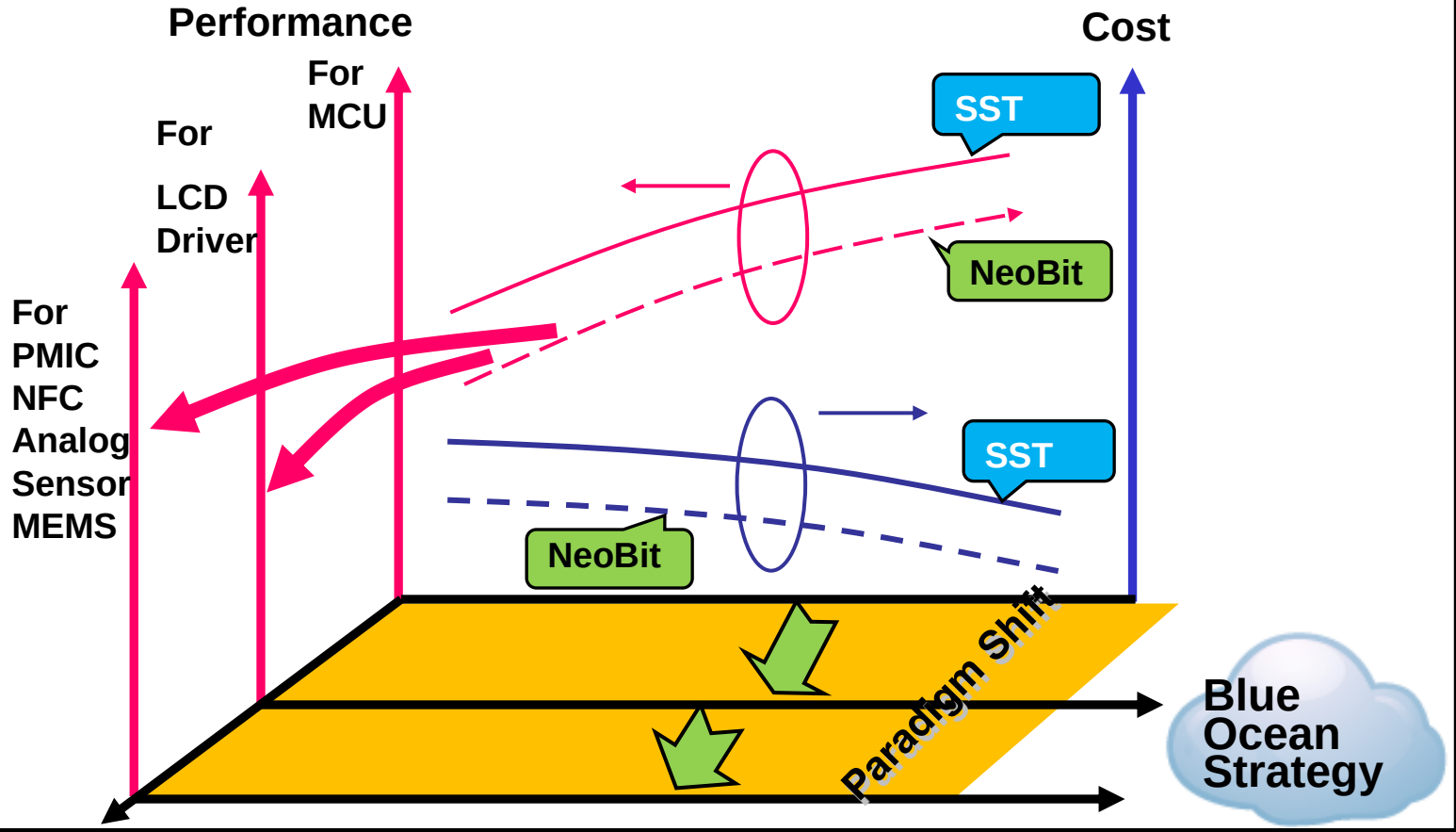


Nonvolatile Memory IP 内部

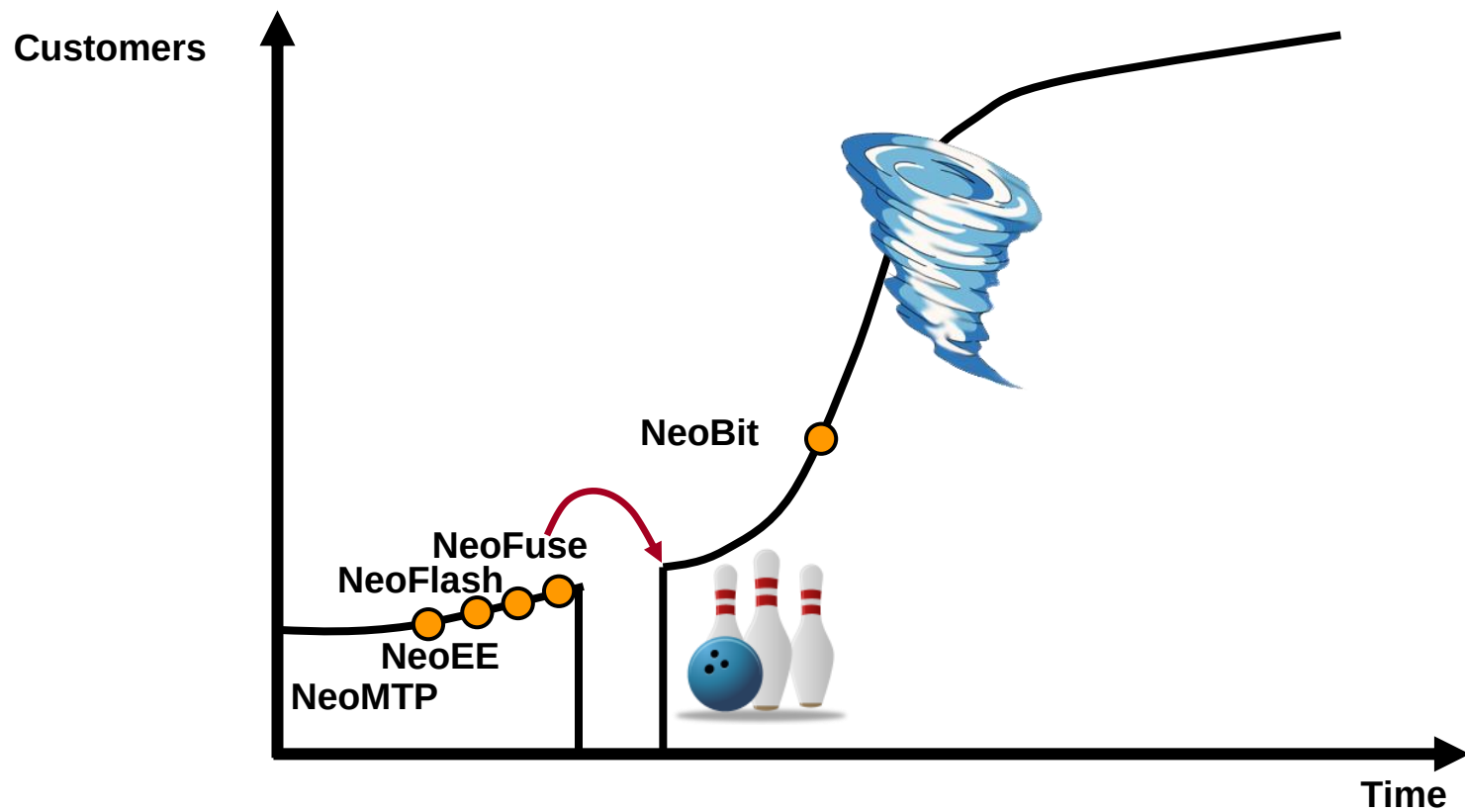


破壞性創新

● *Innovation, Innovation, and Innovation !*

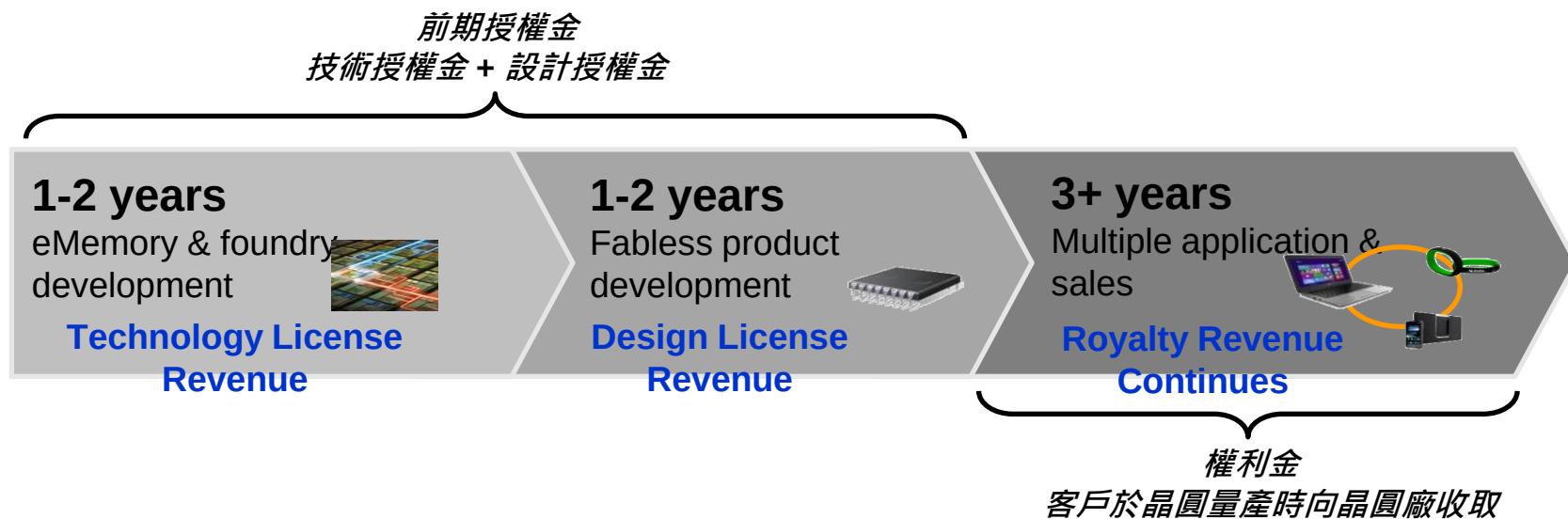


跨越鴻溝



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，220位員工，149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) Usage 設計授權數
3) 權利金



全球客戶



Foundry



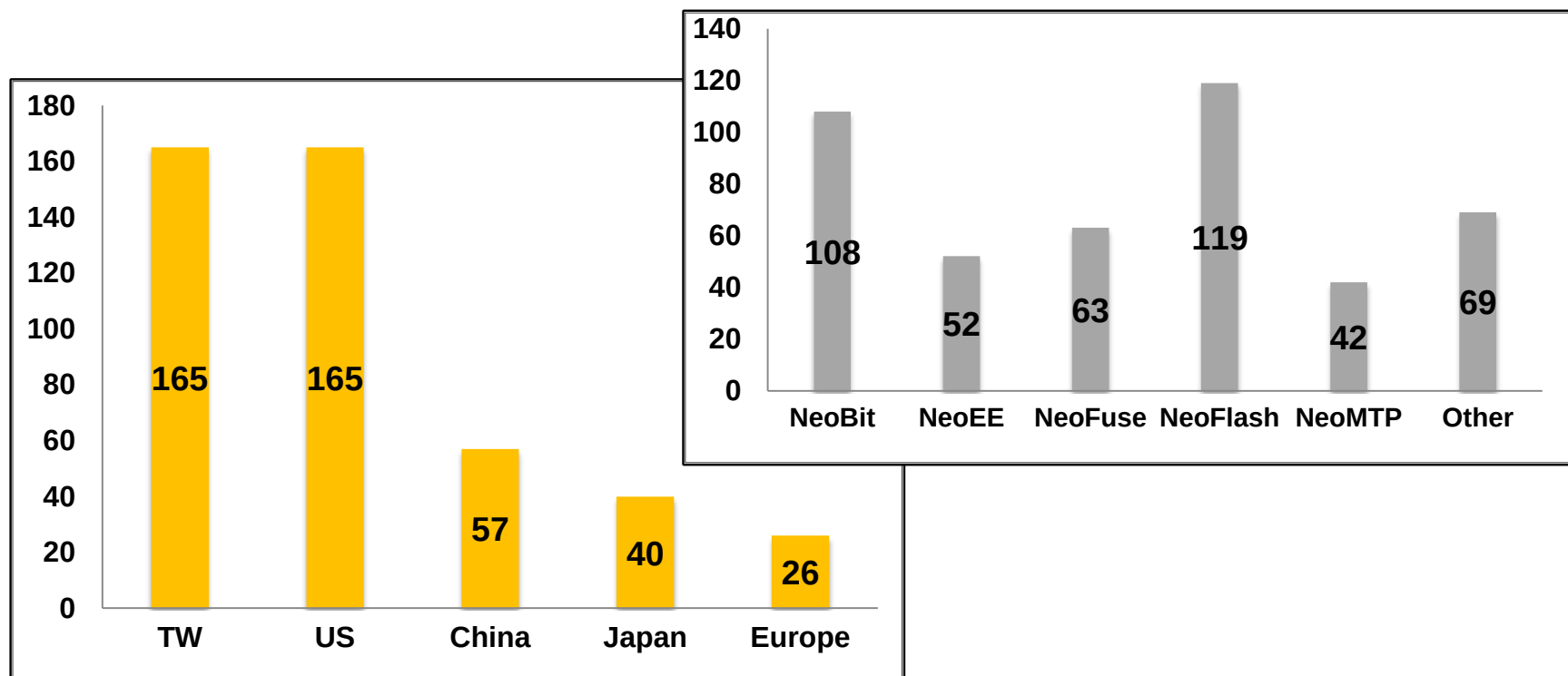
IDM



	Taiwan	China	Korea	Japan	North America	Europe	Others
Foundry	5	6	3	2	1	1	1
IDM	0	0	0	8	2	1	0
Fabless	226	331	49	31	168	80	31

專利佈局

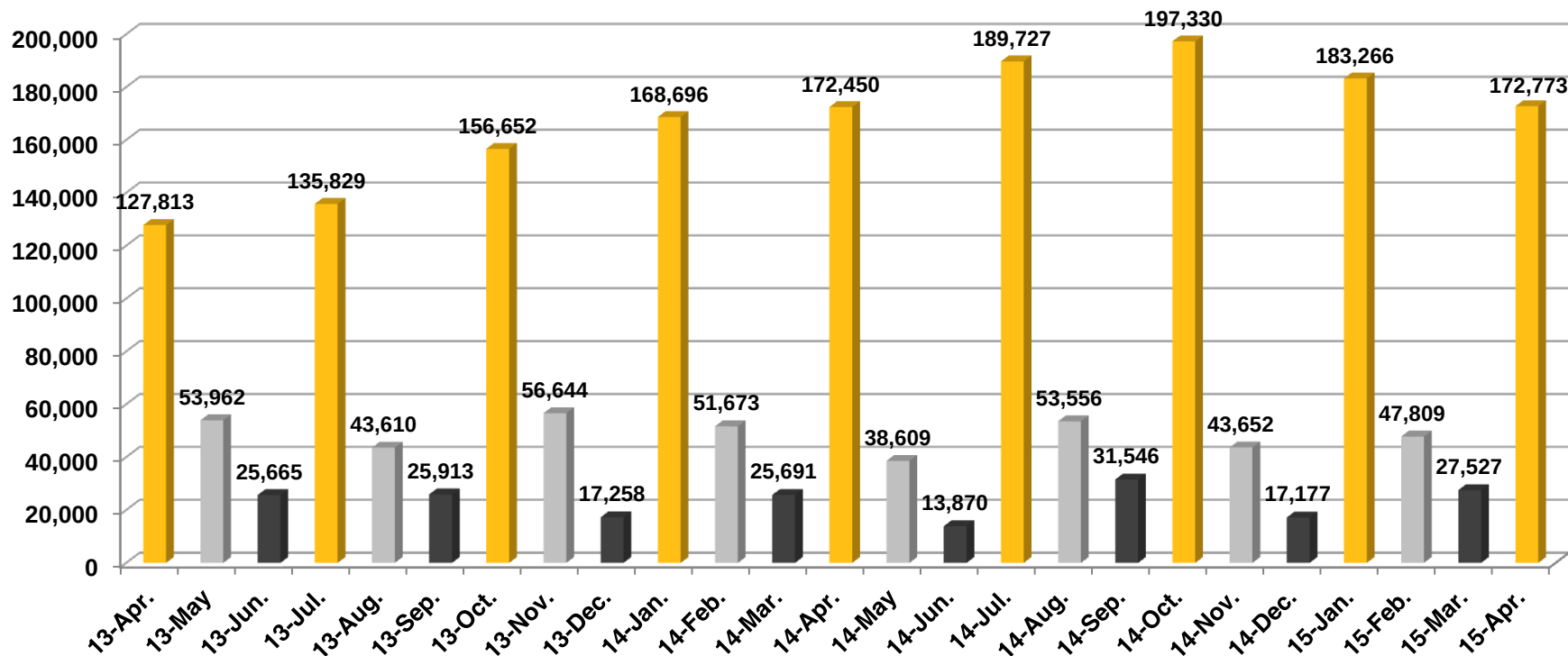
	4Q14	1Q15	Diff.
Pending	166	175	+9
Issued	269	278	+9
Total	435	453	+18



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

1Q 各項營收

Unit: NTD thousands

	1Q15	4Q14	% change	1Q14	% change	2014	2013	% change
Licensing	64,056	51,849	23.54%	75,045	-14.64%	246,073	245,688	0.16%
Royalty	194,546	206,310	-5.70%	171,015	13.76%	757,904	562,570	34.72%
Total	258,602	258,159	0.17%	246,060	5.10%	1,003,977	808,258	24.21%

Unit: Number of contracts

		1Q15	4Q14	2014	2013
Technology Licenses		5	3	21	19
Design Licenses	NRE	21	15	82	51
	Usage	82	99	363	342

綜合損益表

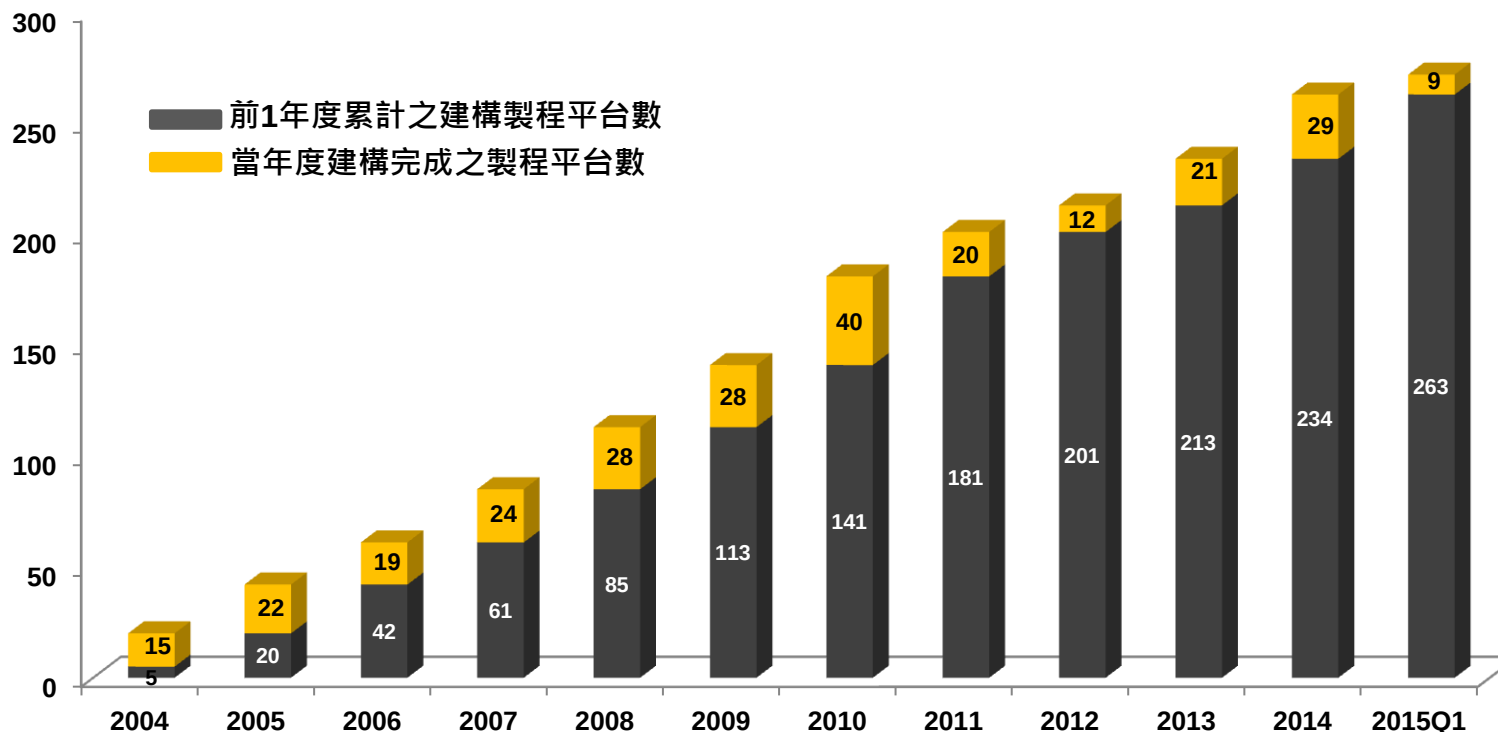
(Unit: NTD thousands)	1Q15	4Q14	% change	1Q14	% change
Revenue	258,602	258,159	0.2%	246,060	5.1%
Gross Margin	100%	100%	-	100%	-
Operating Expenses	128,976	148,501	-13.1%	126,719	1.8%
Operating Margin	50.1%	42.5%	+7.6ppts	48.5%	+1.6ppts
Net Income	114,423	100,896	13.4%	110,936	3.1%
Net Margin	44.2%	39.1%	+5.1ppts	45.1%	-0.9ppts
EPS (Unit: NTD)	1.51	1.33	13.5%	1.46	3.4%
ROE	24.8%	23.4%	+1.4ppts	25.8%	-1.0ppts

技術授權合約及累計平台數

單位：合約數

年度	2012	2013	2014	20151Q
授權數	12	19	21	5

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 Mar.) : **74***
- **22** for NeoBit, **26** for NeoFuse, **1** for NeoFlash, **17** for NeoEE, and **8** for NeoMTP.

	16nm	28nm	40nm	55/65nm	80/90nm	0.11~ 0.13um	0.15~ 0.18um	>0.25 um	Total
NeoBit	-	-	-	1	-	8	12	2	22
NeoFuse	1	7	4	8	1	3	2	-	26
NeoFlash	-	-	-	1	-	-	-	-	1
NeoEE	-	-	2	-	1	4	9	1	17
NeoMTP	-	-	-	1	2	2	3	-	8

Note*: 9 platforms qualified in 1Q; 5 platforms kicked off in 1Q.

目前正在建構的技術製程平台

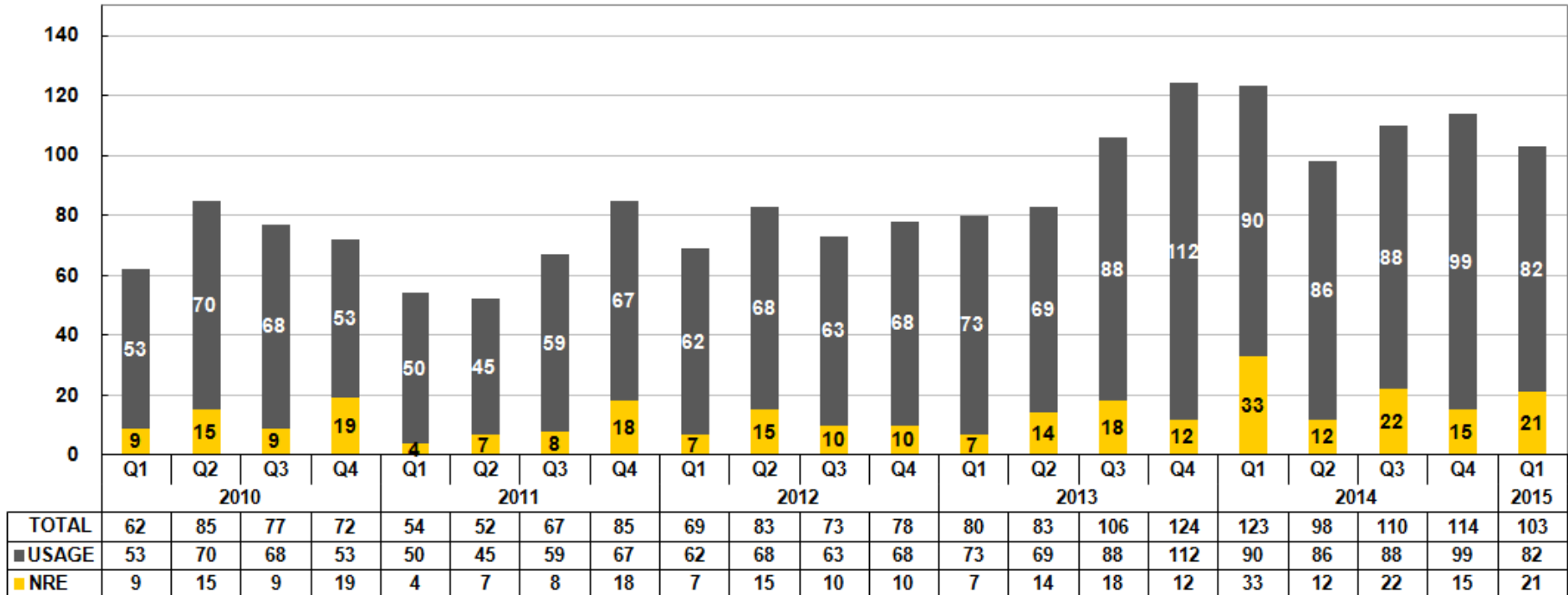
12" Fabs	Production	Development	NVM Type	Process Type
16nm	0	1	OTP	FF+
28nm	2	7	OTP	LP/HPM, HLP/HPM, LPS
40nm	1	6	OTP, MTP	HV-DDI, LP
55/65nm	9	10	OTP, MTP, Flash	LP, HV-DDI, HV-OLED, DRAM, CIS
80/90nm	5	4	OTP, MTP	HV-DDI, HV-OLED, LP
0.13/0.11um	4	5	OTP, Flash	HV-DDI, BCD, Generic
0.18um	1	0	OTP	BCD

8" Fabs	Development	NVM Type	Process Type
0.13/0.11um	12	OTP, MTP, Flash	HV-DDI, BCD, LP, RF, CIS, LL
0.18/0.16/0.152um	26	OTP, MTP	Generic, LP, LL, MR, HV, Green, BCD
0.25um	2	OTP, MTP	BCD
0.35um	1	OTP	UHV

*As of Mar. 31, 2015

每季設計授權數(New Tape Out)

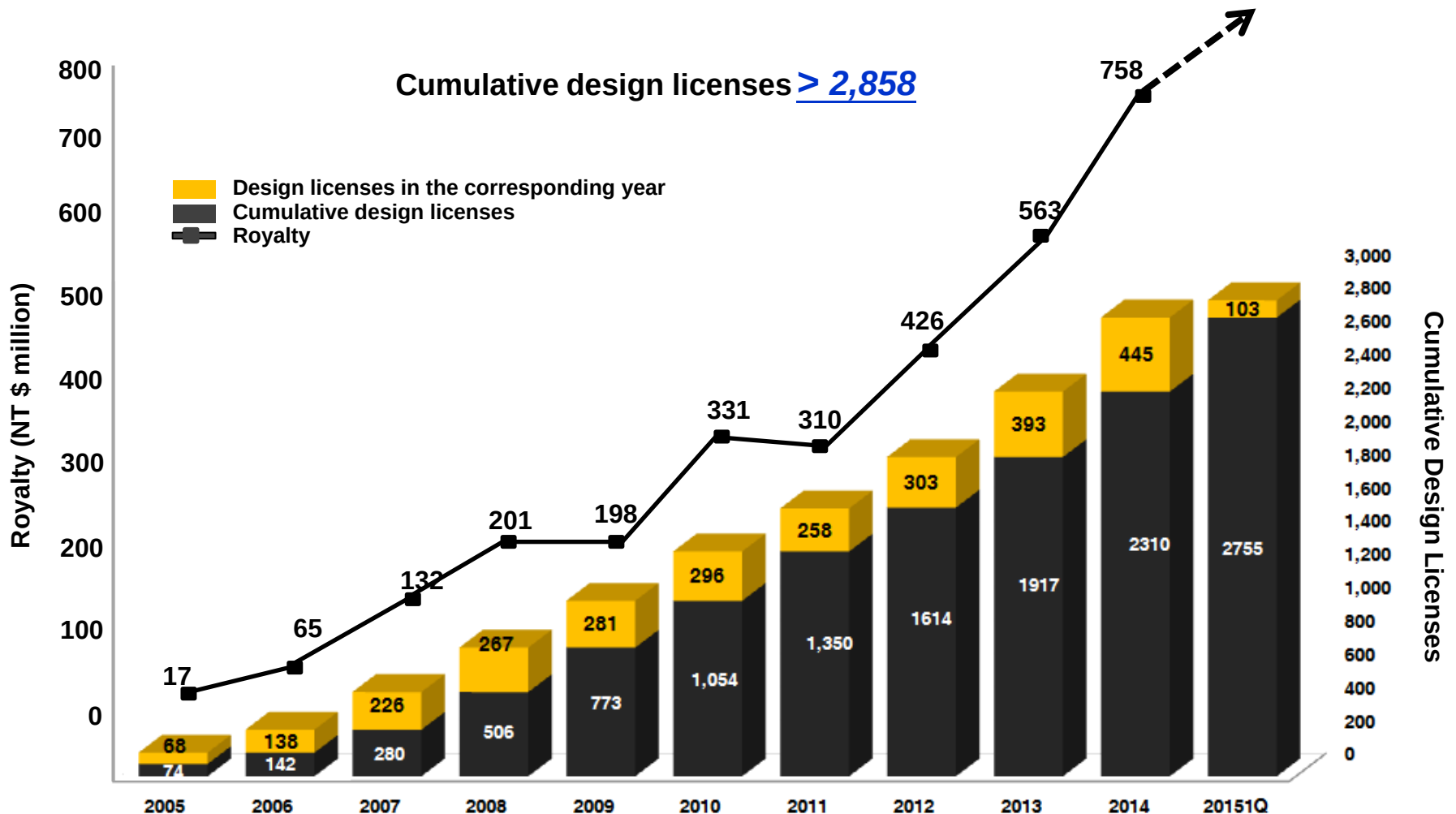
- Total **103** NTO as of 1Q 2015 (**445**@2014 **393**@2013, **303**@2012, **258**@2011)



Usage : Usage of pre-qualified and verified IP (charged by per product tape out or annual package), the cycle time from design implementation to royalty payments for mass production is faster, typically less than one year.

NRE: NRE covers the customization of IP that must undergo new verification or qualification. It typically requires 1 to 1.5 years before resulting in royalty revenue.

權利金取決於過去累積的設計授權數目

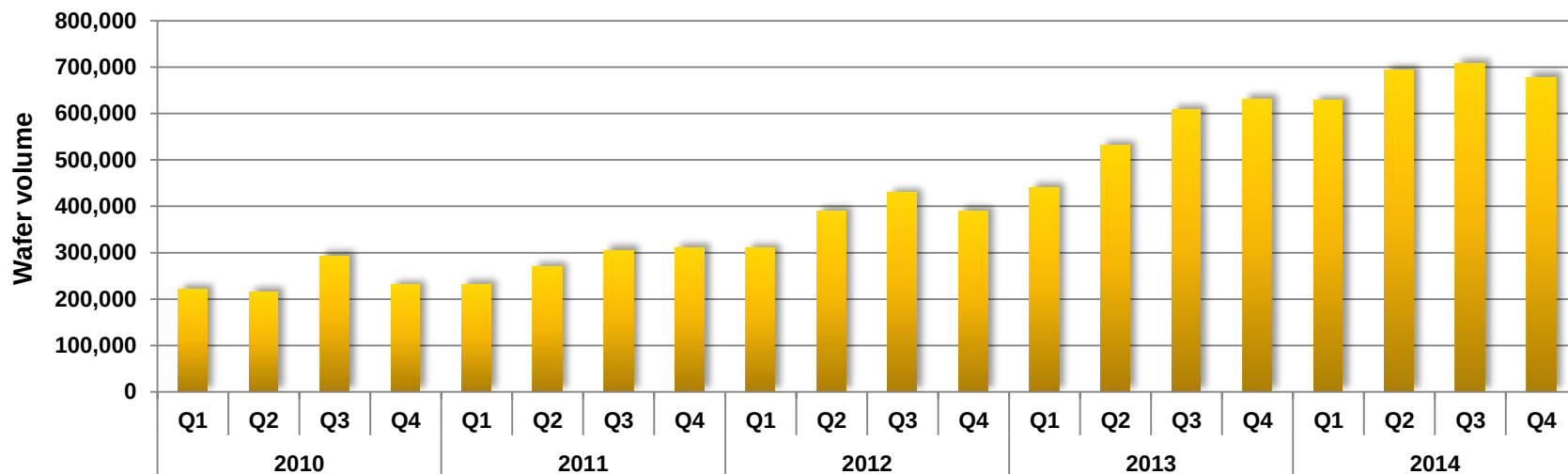


note 1: Due to the 2009 recession, royalty income was down annually 1.5%.

note 2: Pre-payment of royalty fees by a single customer contributed to 2010 annual growth of 67%, causing a drop of 6.3% in the following year, 2011.

note 3: CAGR for 2009-2013 was 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 1Q15

	Process node	*% of T	1Q15	4Q14	2014	2013
8"	0.5+	1%	0%	0%	0%	0%
	0.25/0.35	4%	32.1%	30%	30.5%	27.3%
	0.15/0.18	13%	8%	8%	11.9%	10.7%
	0.11/0.13	2%	20.5%	28.9%	20.8%	19.1%
12"	90nm	7%	18.2%	18.2%	16.3%	4.8%
	65nm	12%	0.3%	0.1%	0%	0%
	40/45nm	15%	0%	0%	0%	0%
	28nm	30%	0%	0%	0%	0%
	20nm	16%	0%	0%	0%	0%
8"		20%	14.1%	14.2%	15.6%	14.2%
12"		80%	1.5%	1.4%	1.4%	0.69%
Total		100%	4.1%	4.3%	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

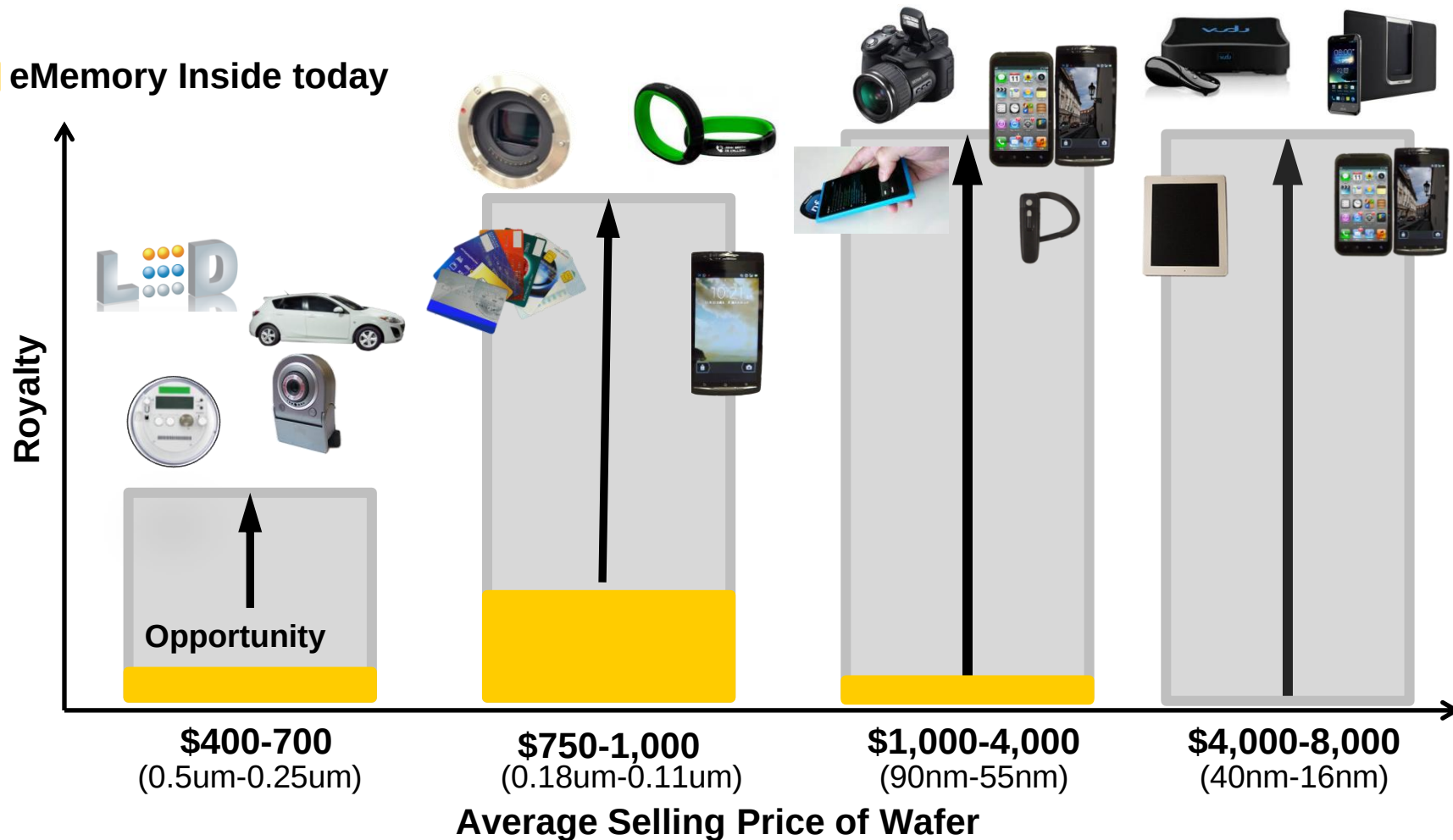
NeoFlash

NeoEE

NeoMTP

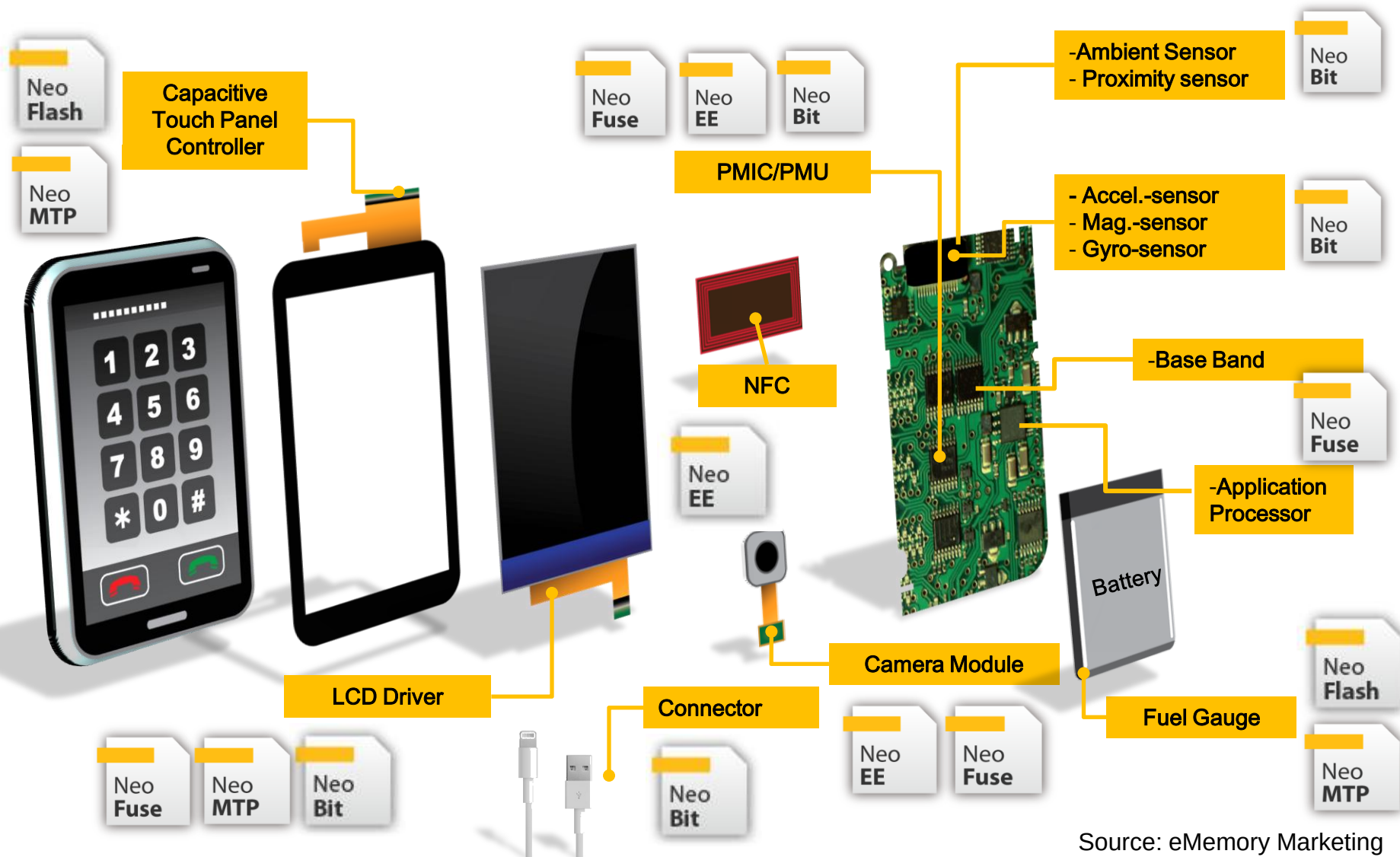
商機與潛力

 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



Benefits from Using eMemory IPs

Design-in for

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

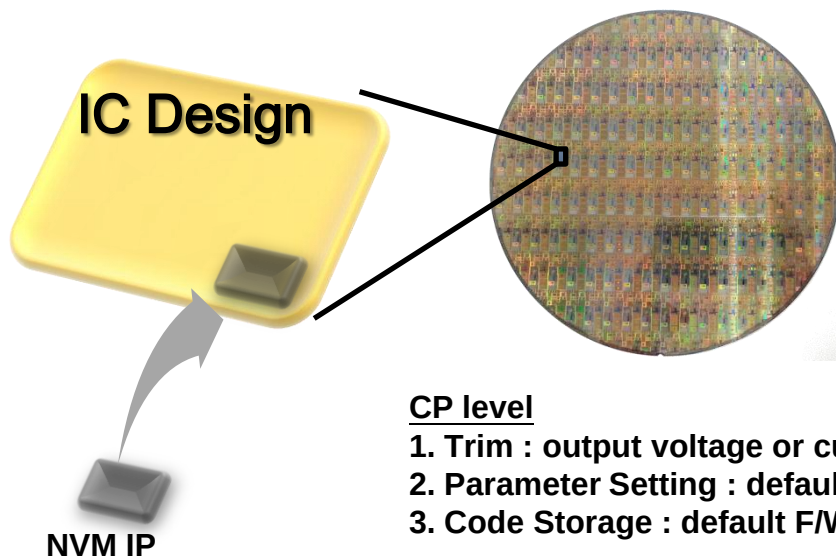
Package/FT level

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



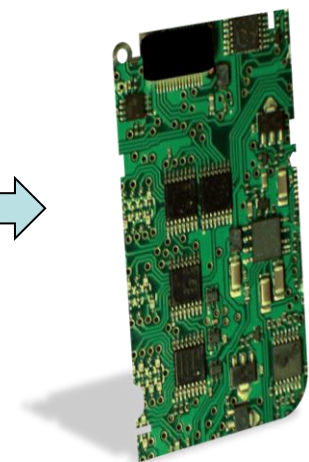
CP level

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



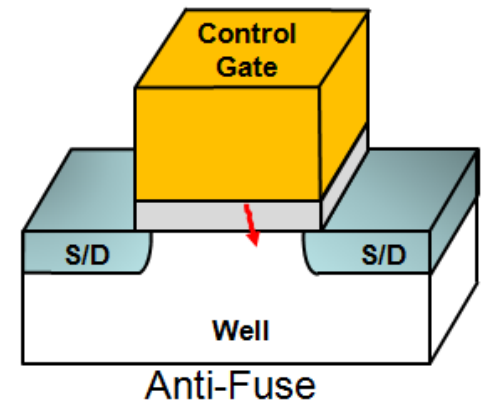
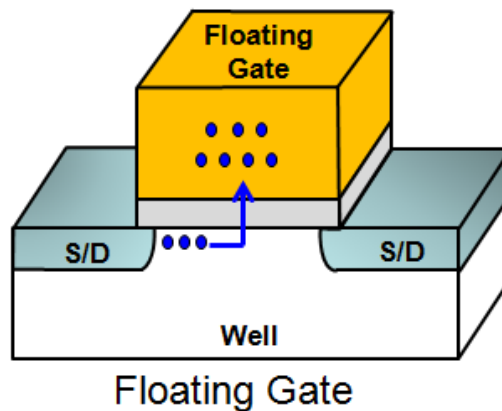
高機密性的安全設定

- 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



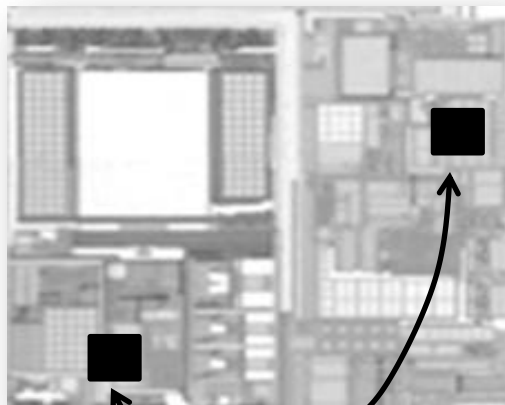
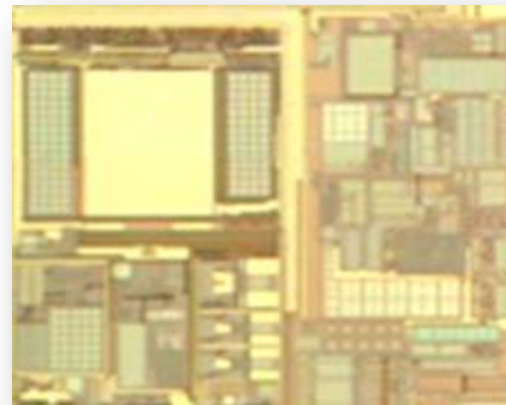
reverse
copy

re-produce



without protection

Fake Product

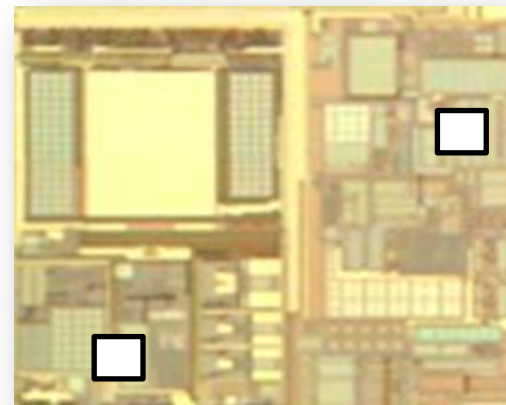


reverse
copy

re-produce



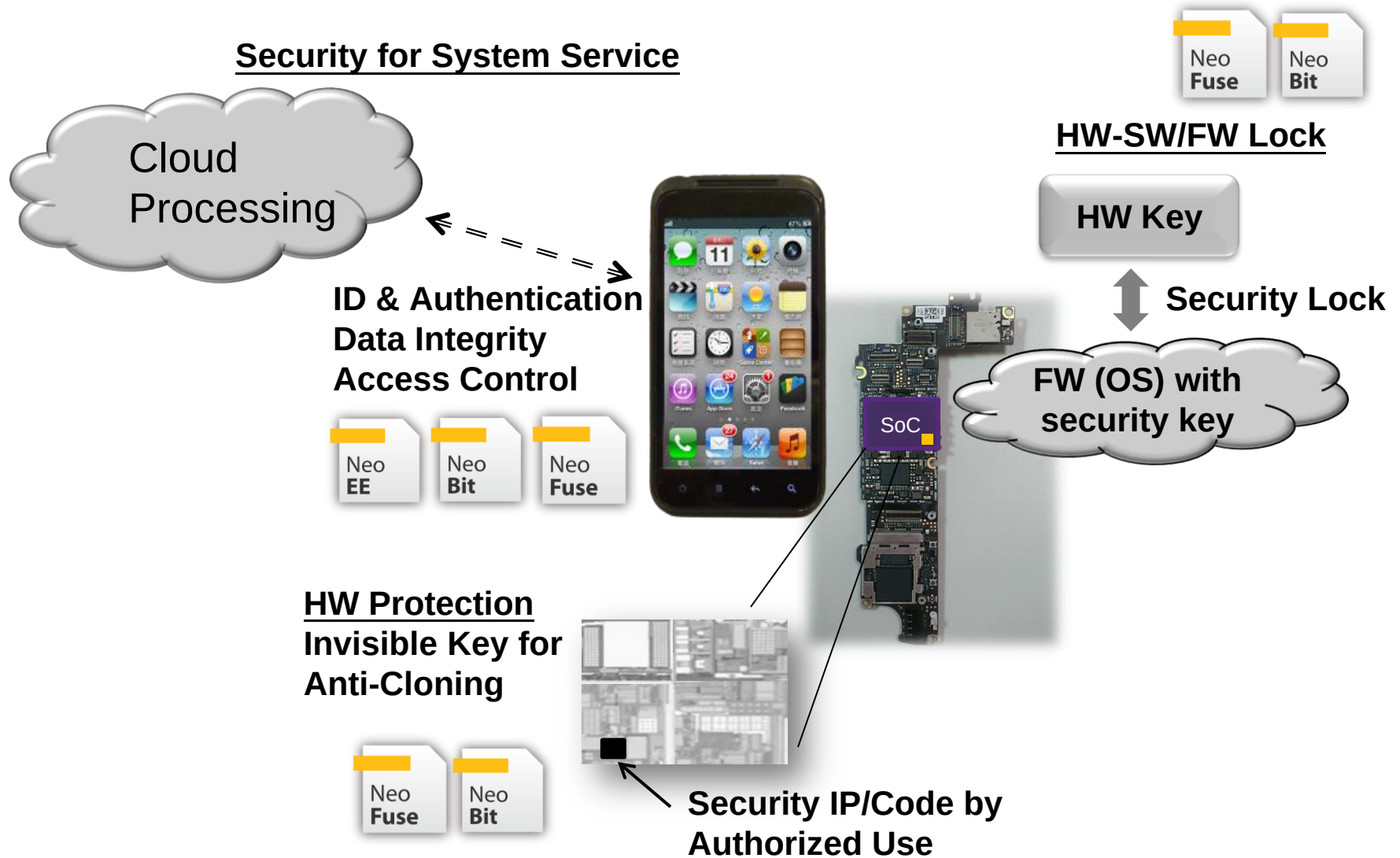
with protection



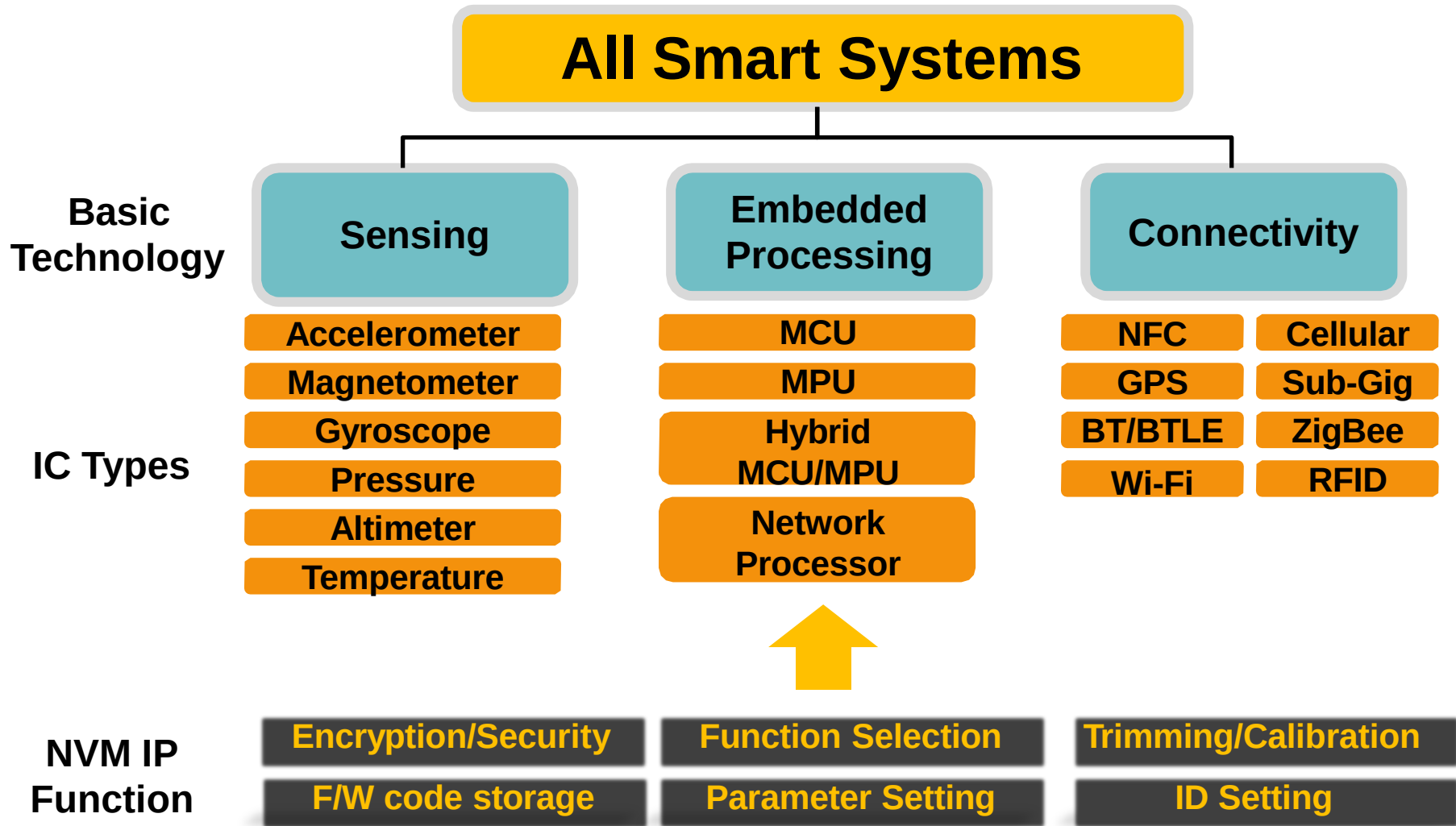
**Security IP/Code by
Authorized Use**

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

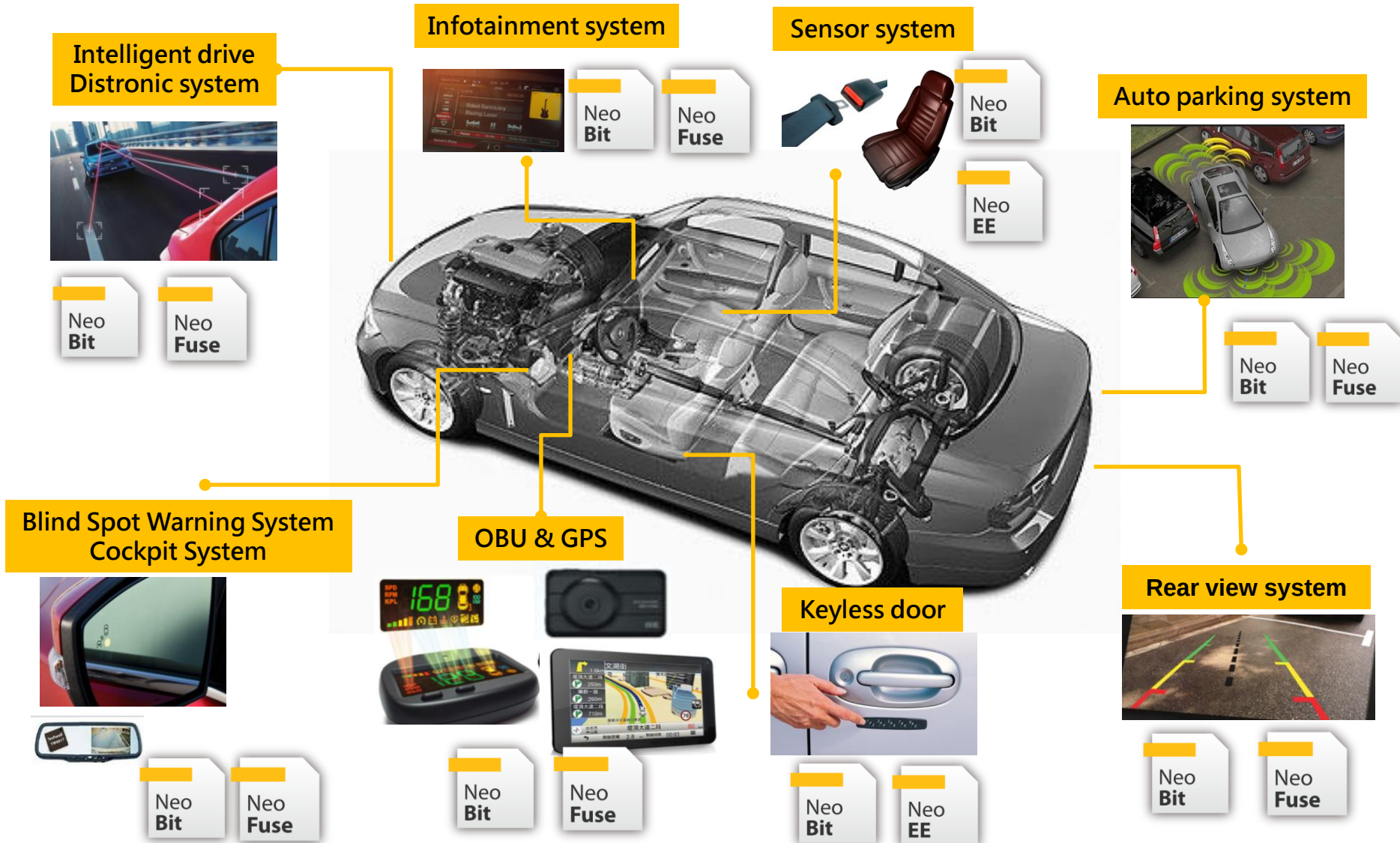
力旺矽智財引領高安全性應用



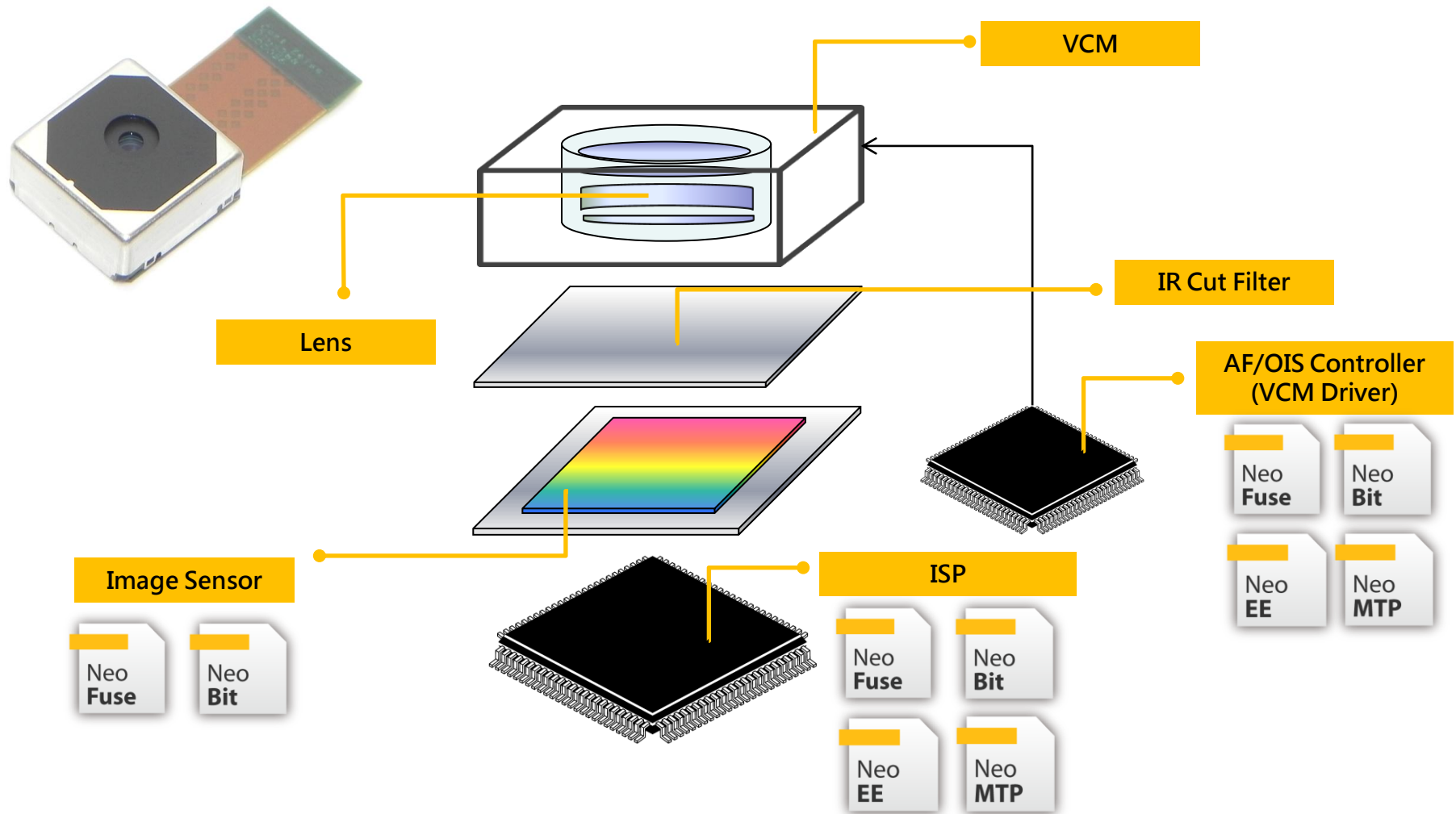
在IoT中之NVM IP 需求



Autotronics with eMemory IPs



Imager Module with eMemory IPs



先進液晶顯示驅動晶片

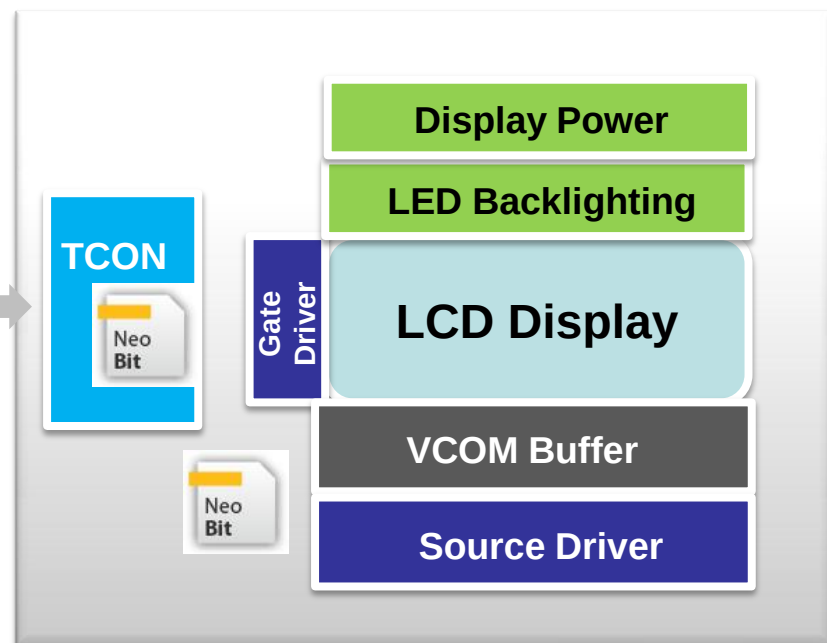
Process Technology : 0.11um HV/80nm HV/55nm HV



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



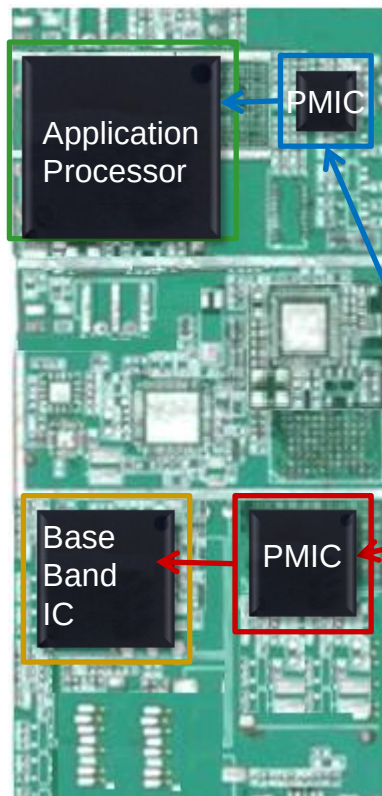
DDI



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

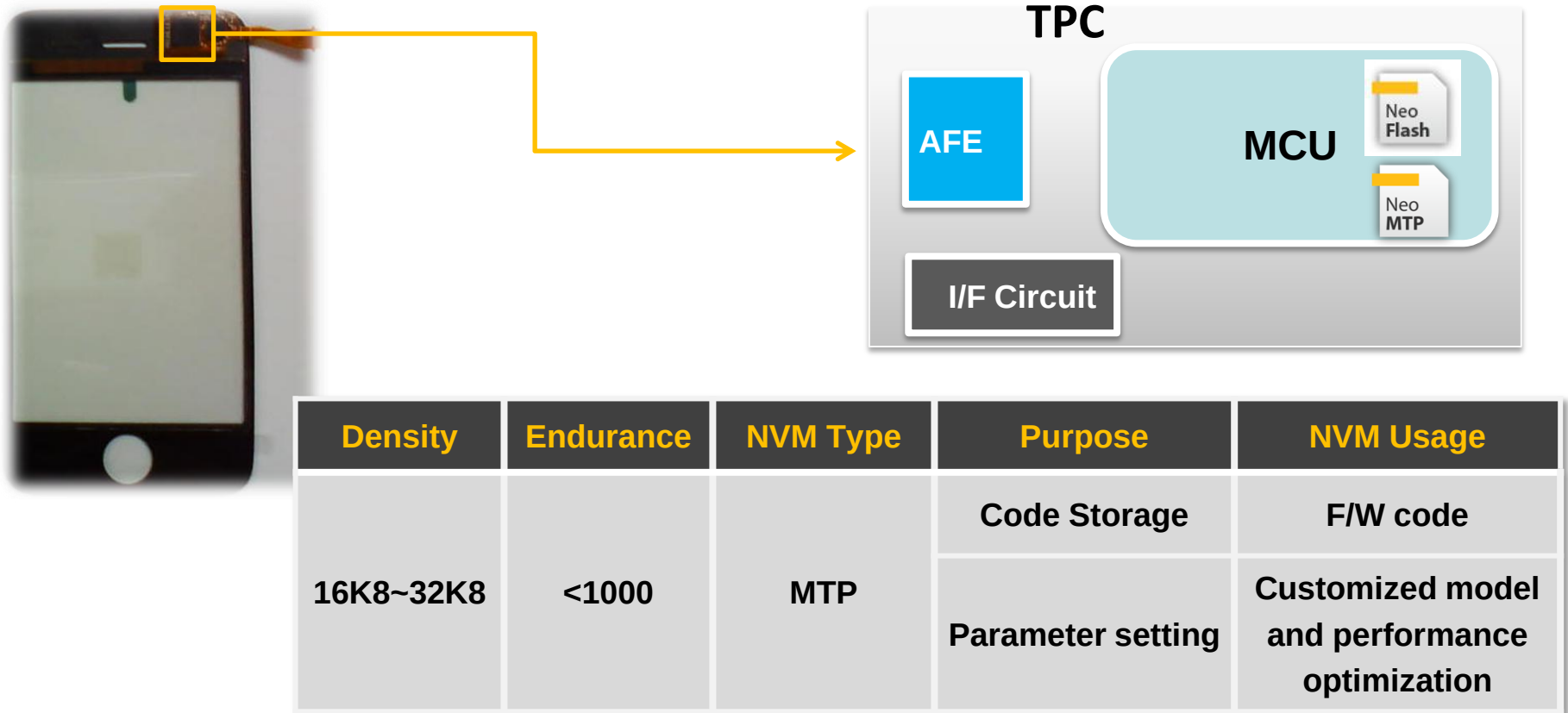


Density	NVM Type	Purpose	NVM Usage
2Kb~4Kb	OTP	Trimming	DC/DC, Bandgap
		Parameter Setting	Design flexibility & Performance optimization
		Code Storage	Start-up behavior & smart power saving algorithm



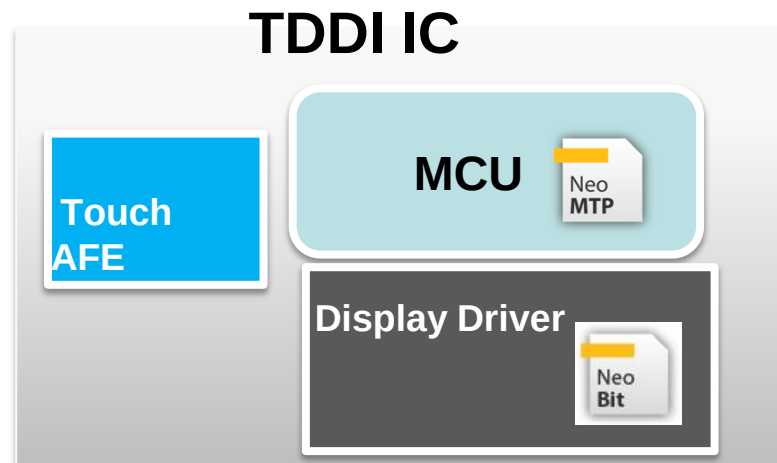
觸控面板控制器晶片

Process Technology : 0.16um HV/0.11um G



內嵌式觸控面板控制器晶片

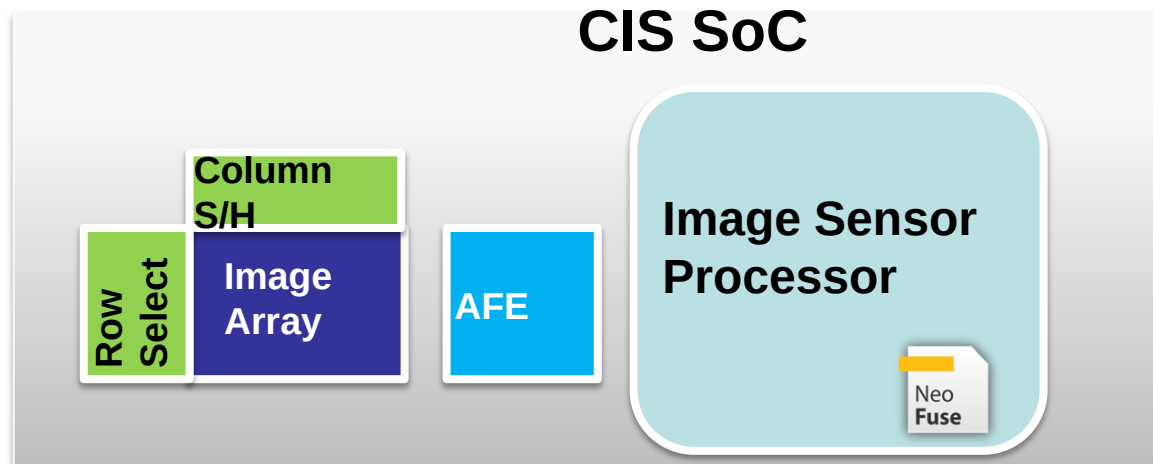
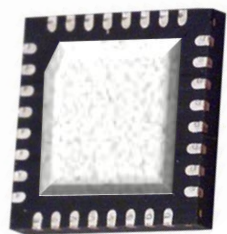
Process Technology : 0.11um HV/80nm HV/55nm HV



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

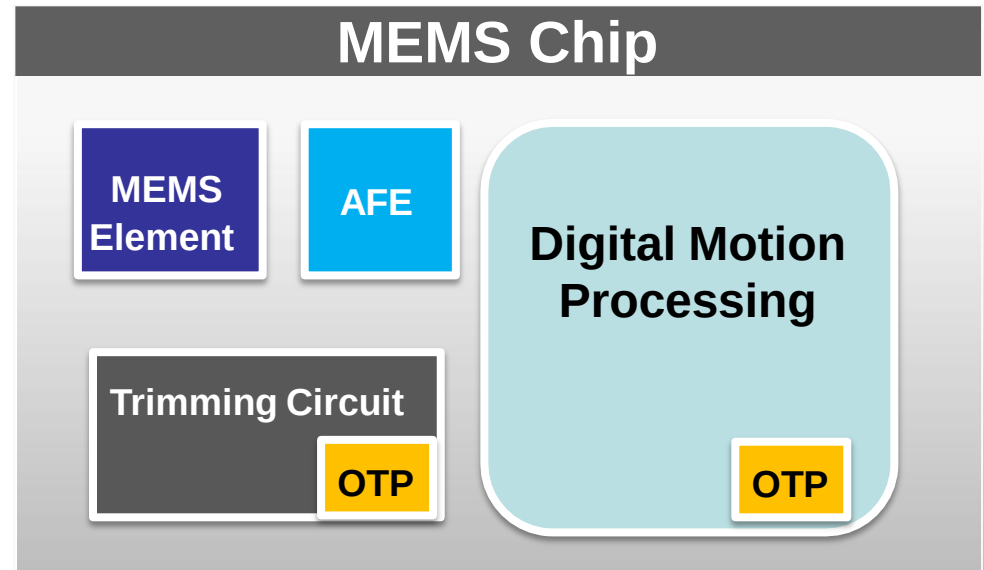
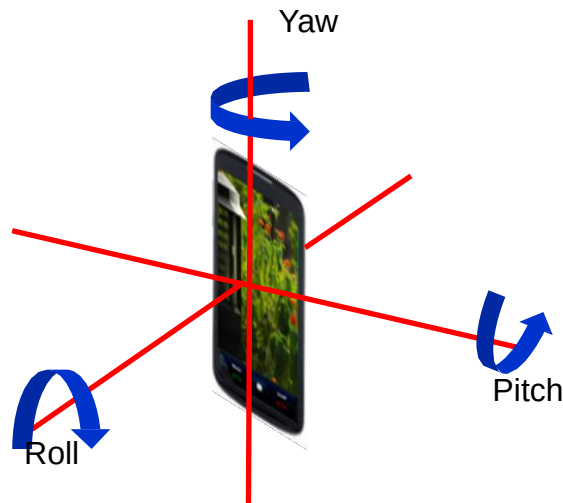
Process Technology : 0.11um CIS/90nm CIS/65nm CIS



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

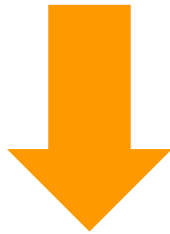


Density	NVM Type	Purpose	NVM Usage
2Kb~4Kb	OTP	Trimming	Factory trimming
		Parameter Setting	Signal filtering
		Code Storage	Geometric computation

取代嵌入式快閃記憶體之競爭優勢

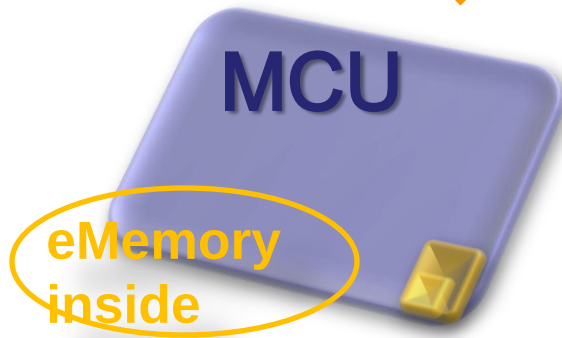


product design & manufacturing by
embedded Flash
Logic Process + 10 Masks



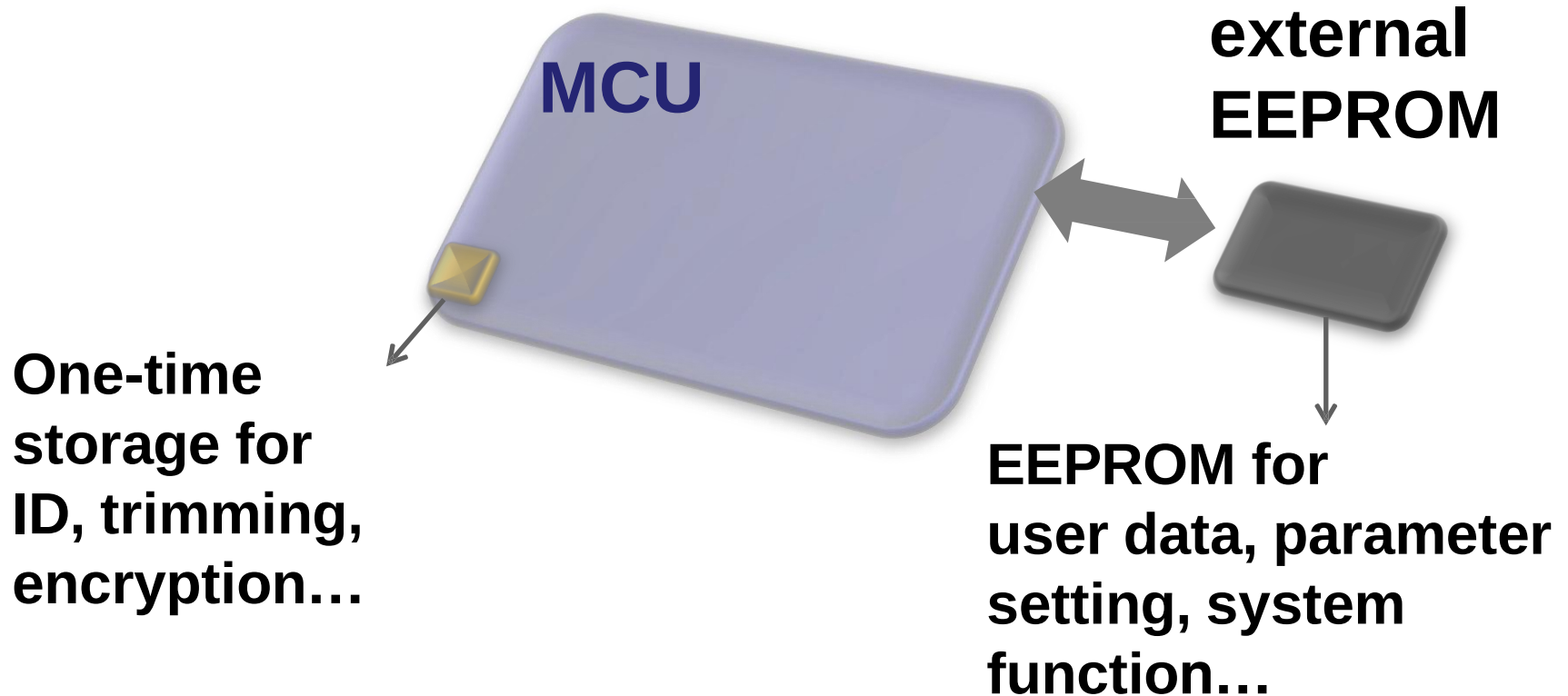
***30% more
cost reduction***

***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**

3Q14 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

2015 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。

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.

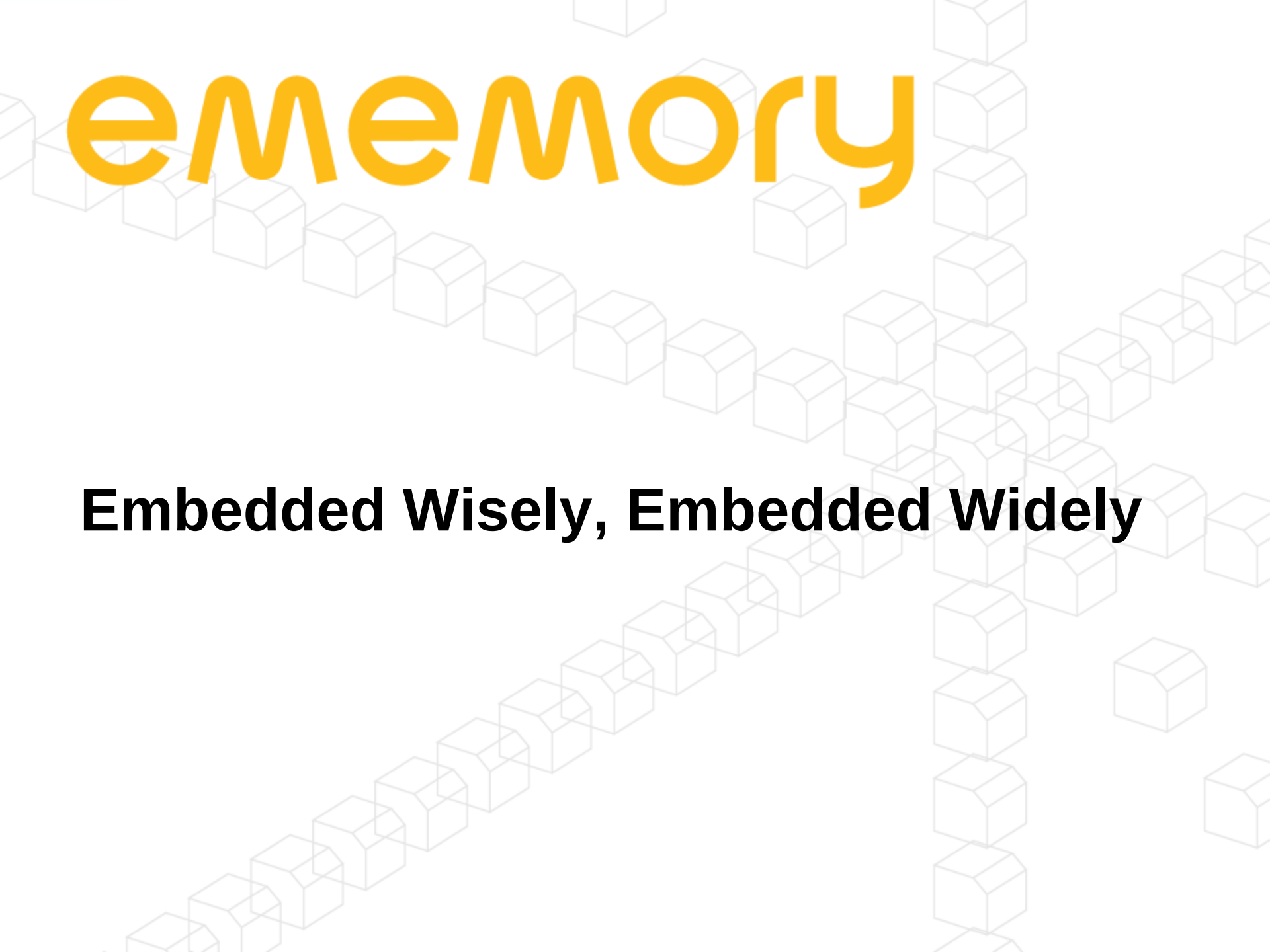
Growth in advanced technology

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

Great IoT era

- Embedded Logic NVM will be a must.

Q & A



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Embedded Wisely, Embedded Widely