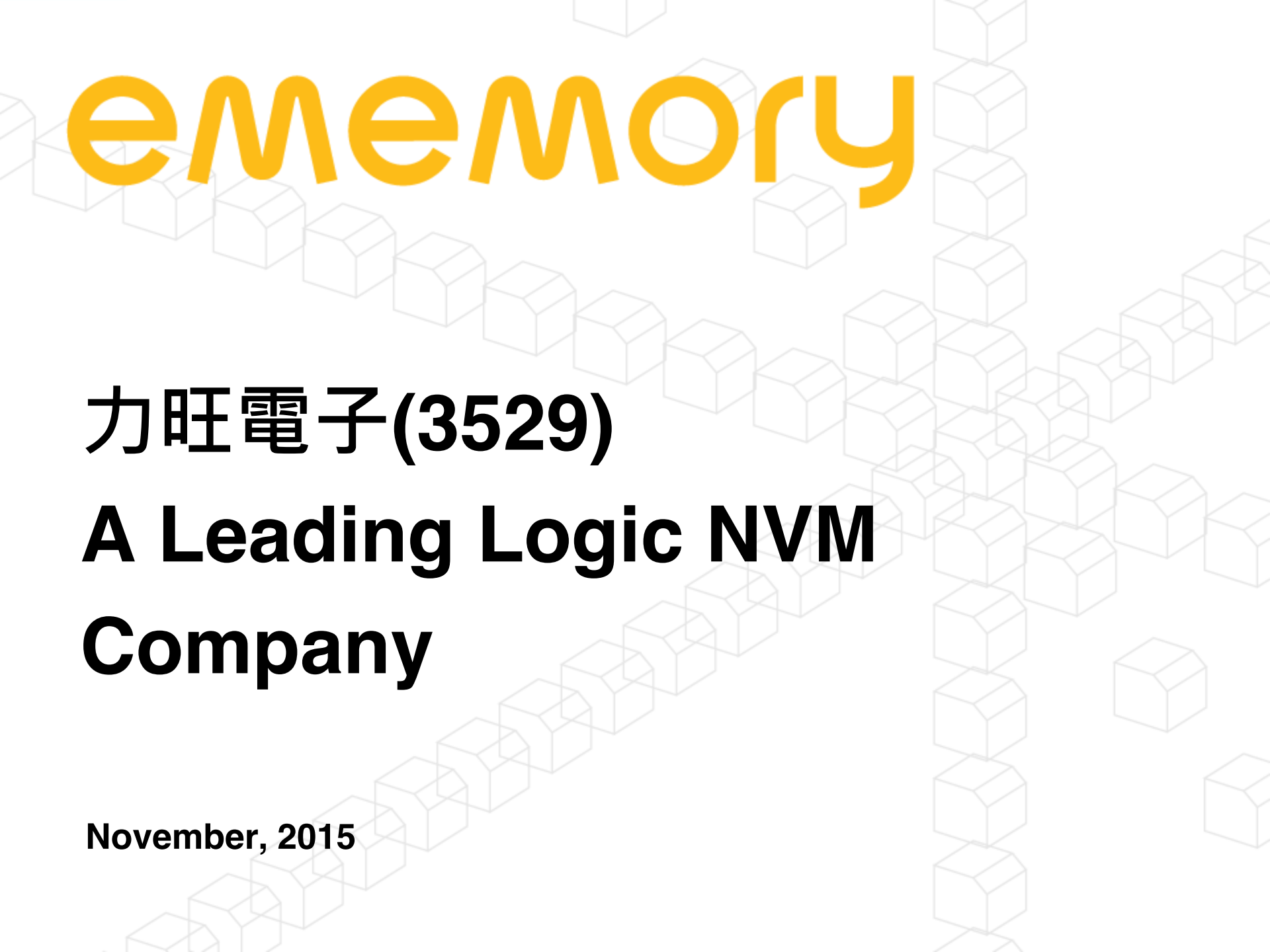


The background of the slide is white, featuring a pattern of numerous small, white, 3D cubes. These cubes are arranged in a way that creates a sense of depth and movement, with some cubes appearing to be in the foreground and others receding into the background. The cubes are scattered across the entire slide, with a higher density in the lower right area.

# 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。

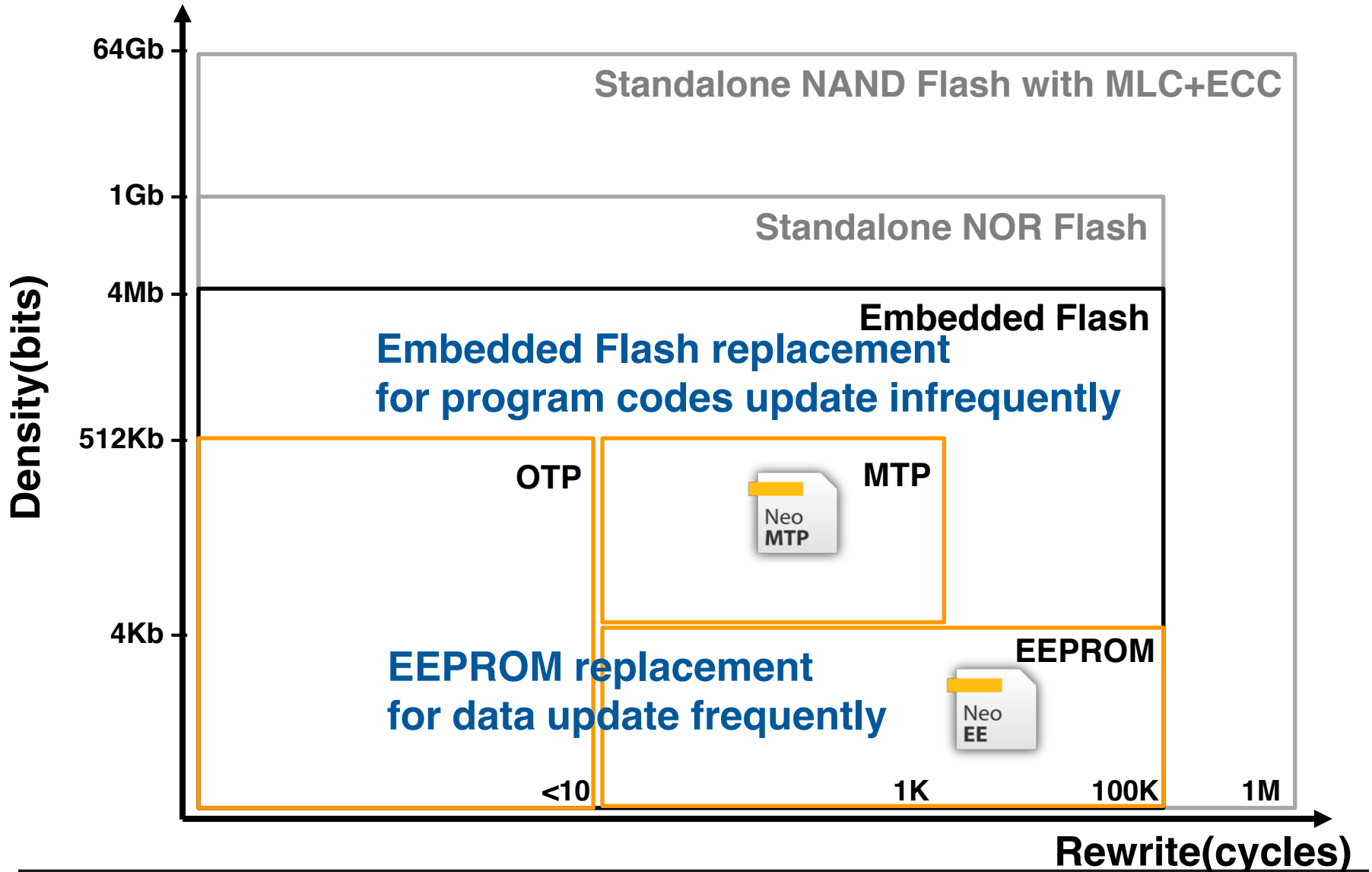
# 投資安全聲明

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。

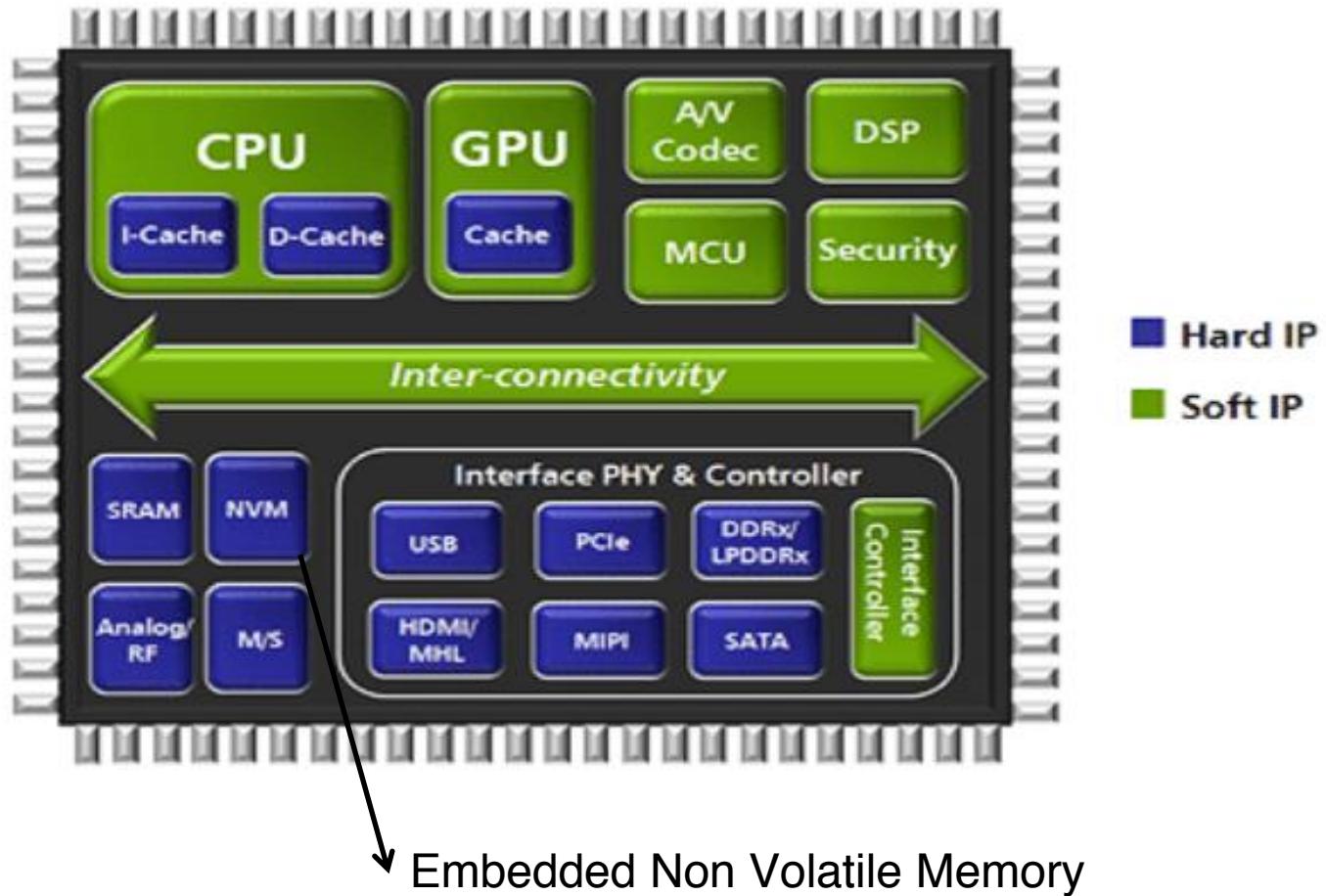
# 大綱

- 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



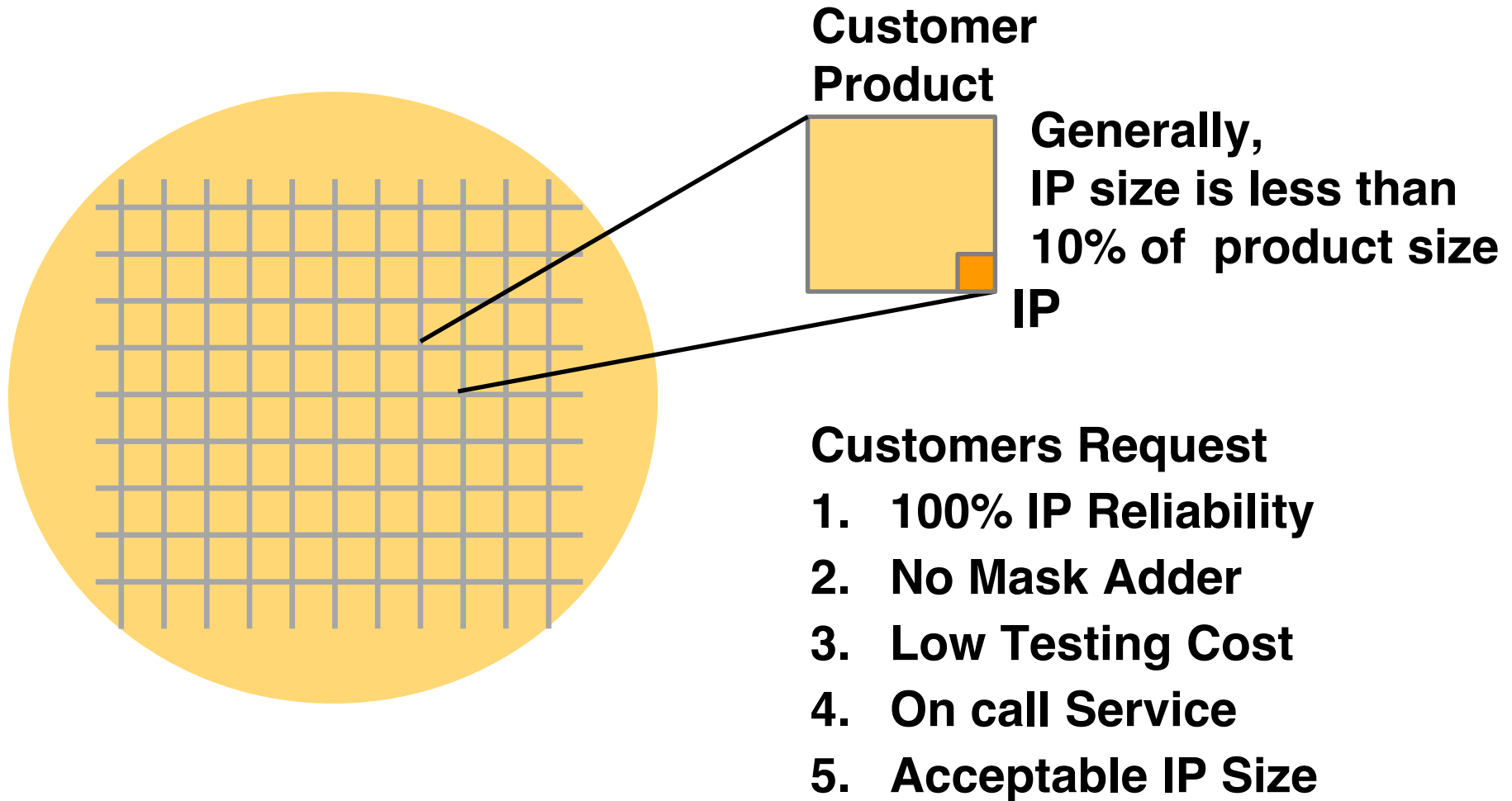
Source : tsmc

# 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       |

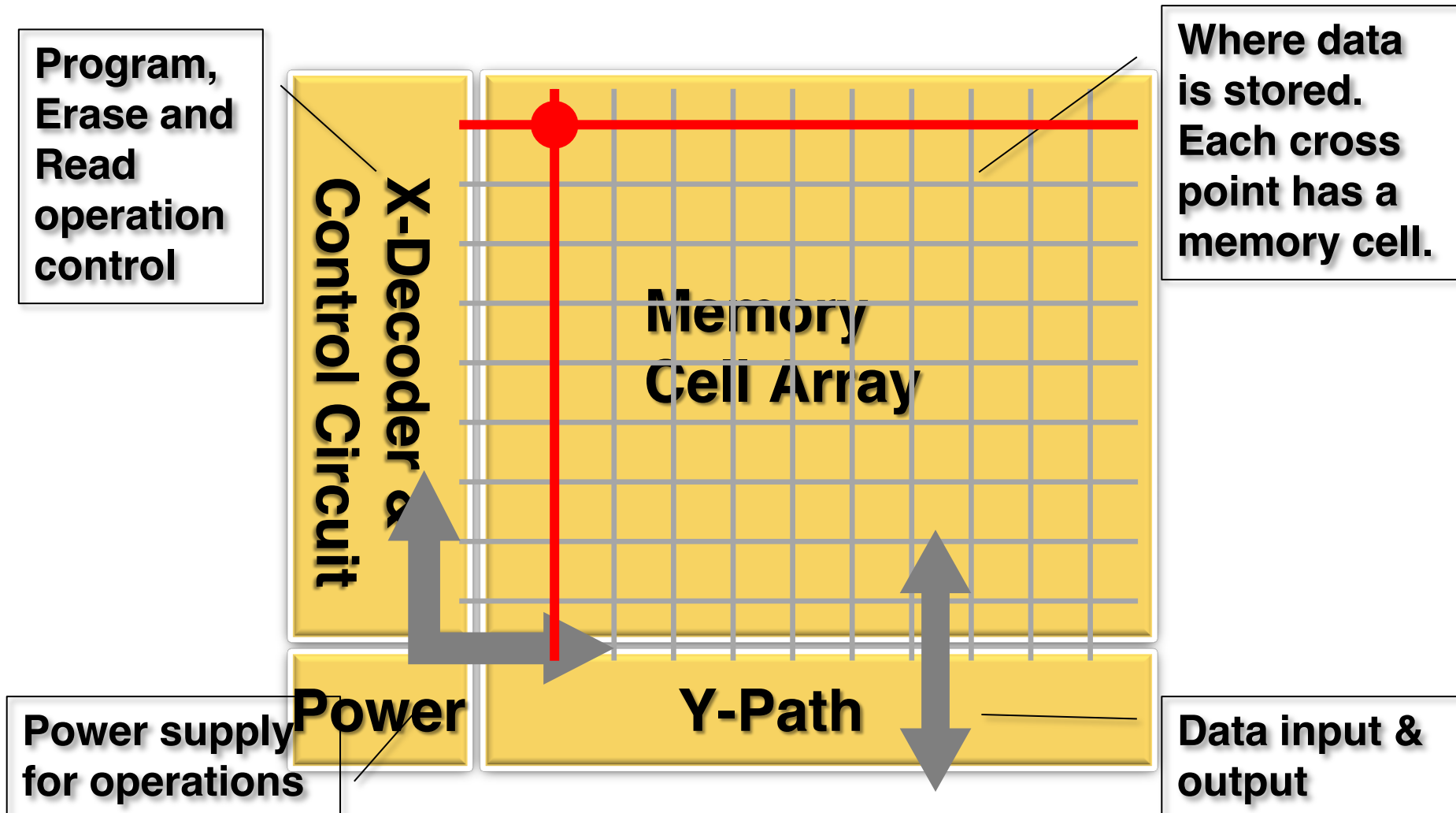
- ROM not programmable, eFuse cannot scale beyond 16Kb, embedded flash expensive and cannot scale after 40 nm
- eMemory's IPs: OTP (antifuse, floating gate) and MTP (floating gate)

# 採用IP之考量



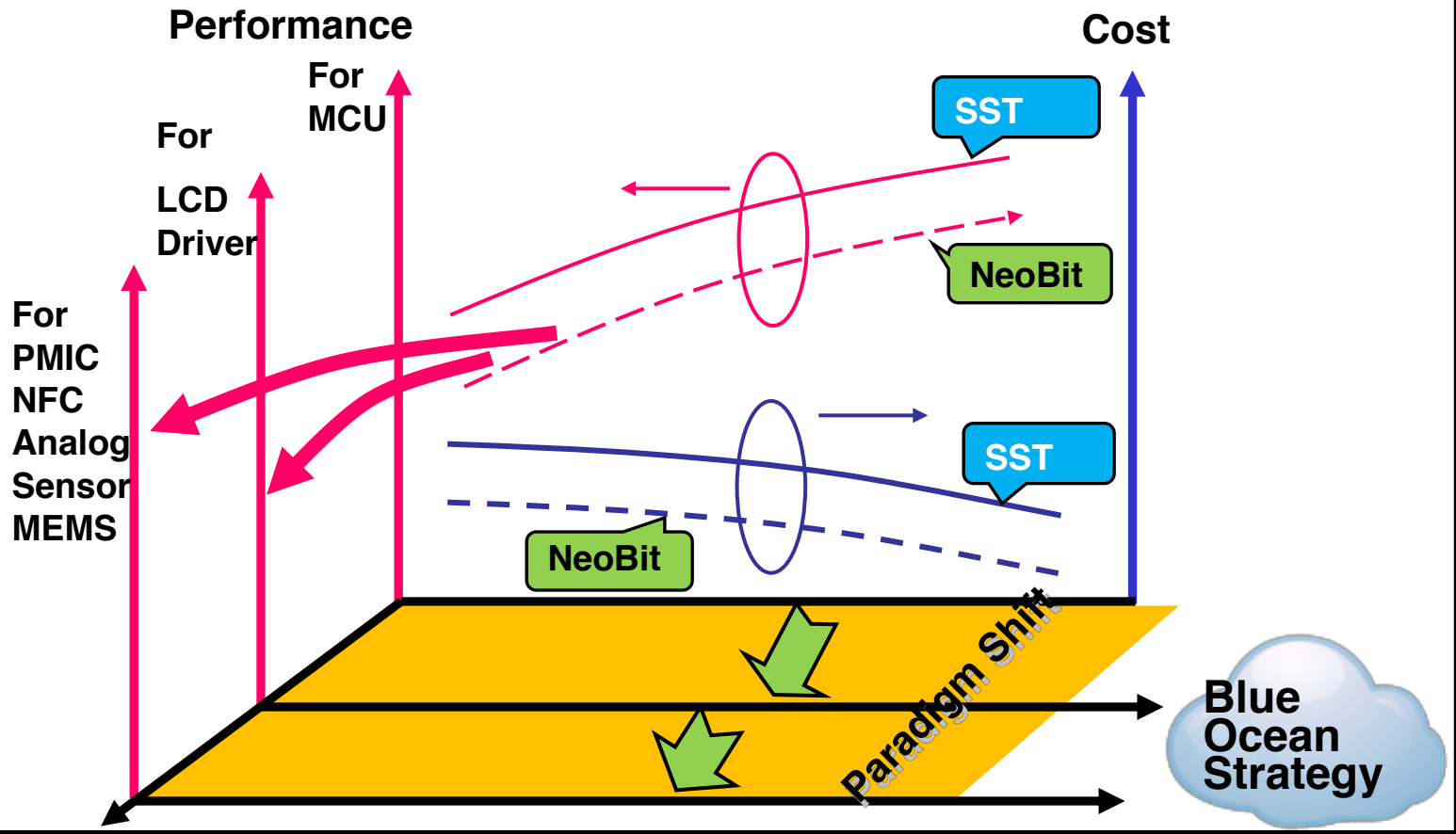


# Non-Volatile Memory IP 内部

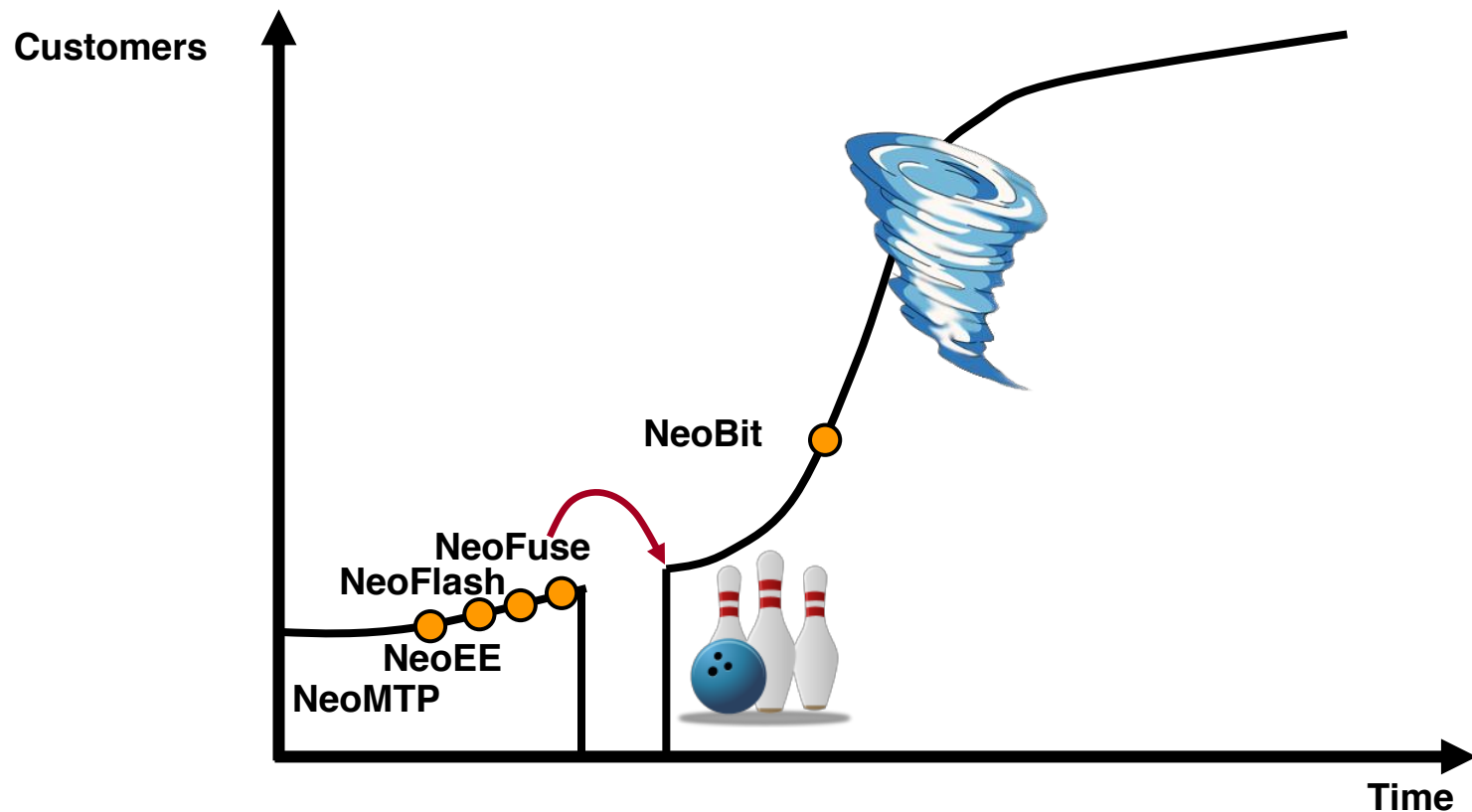


# 破壞性創新

## ● *Innovation, Innovation, and Innovation !*

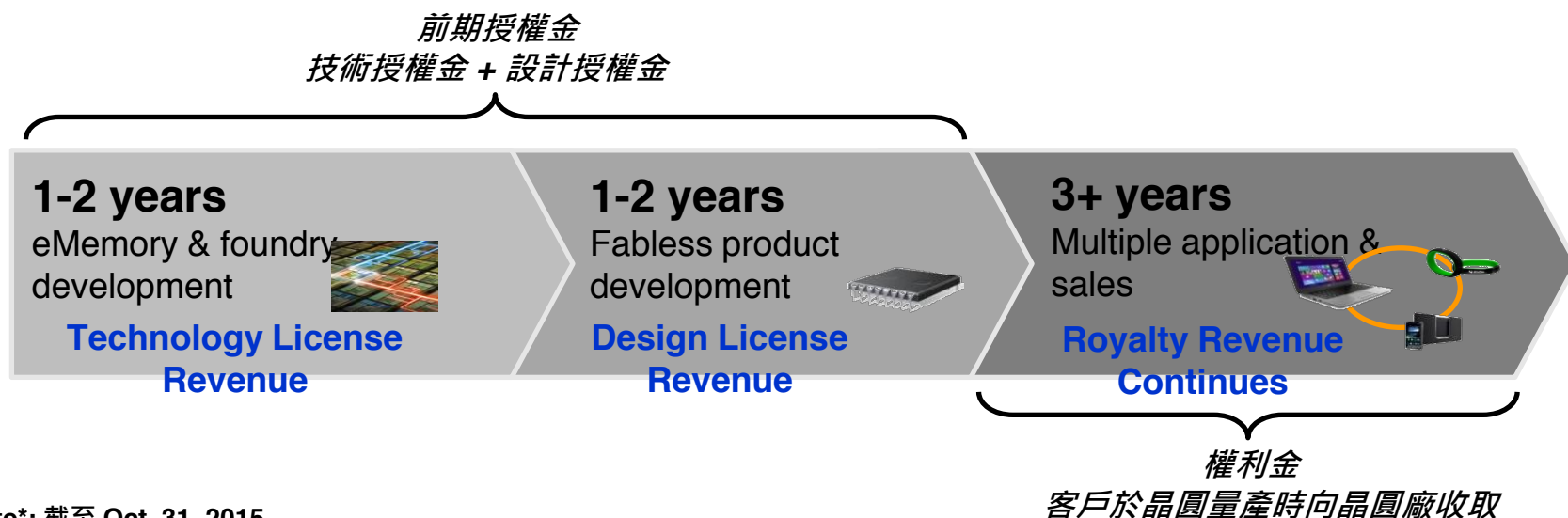


# 跨越鴻溝



# 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



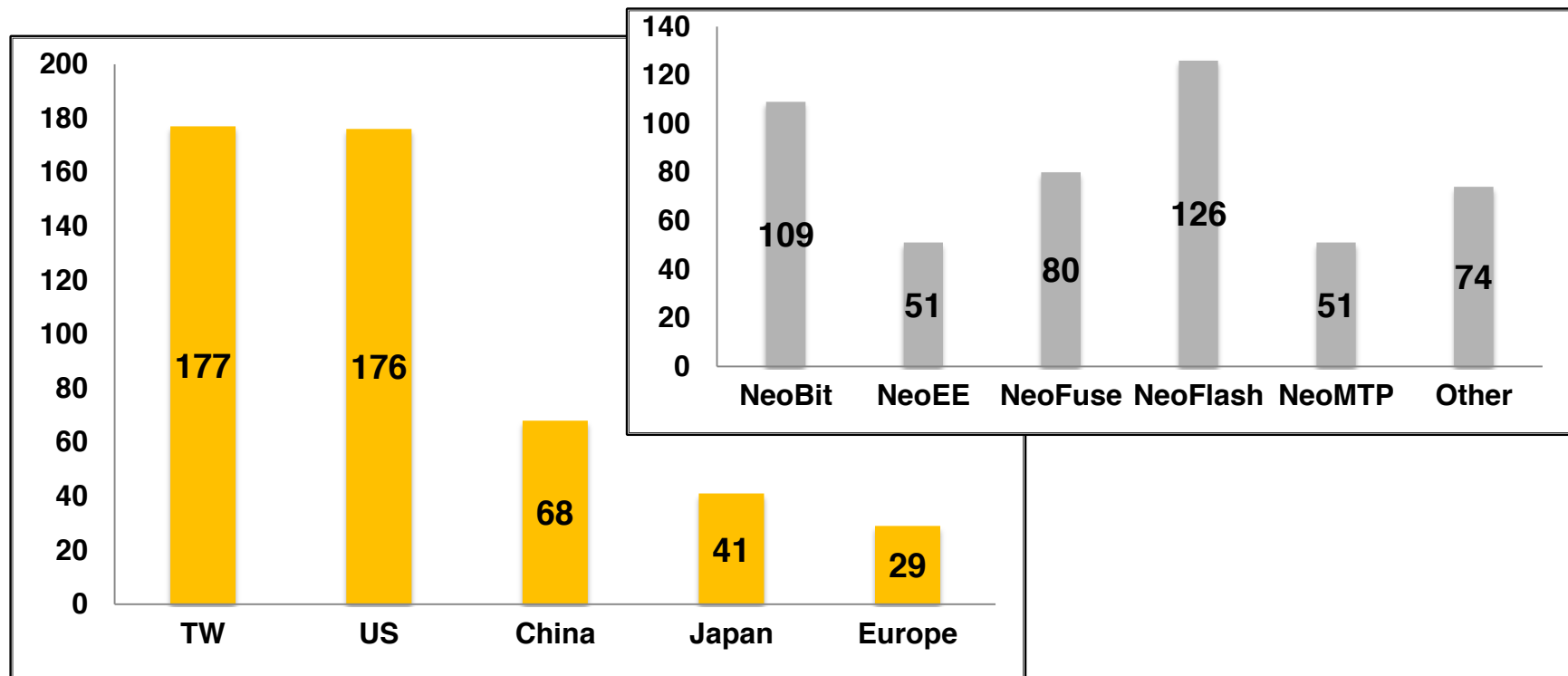
## IDM



|         | 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

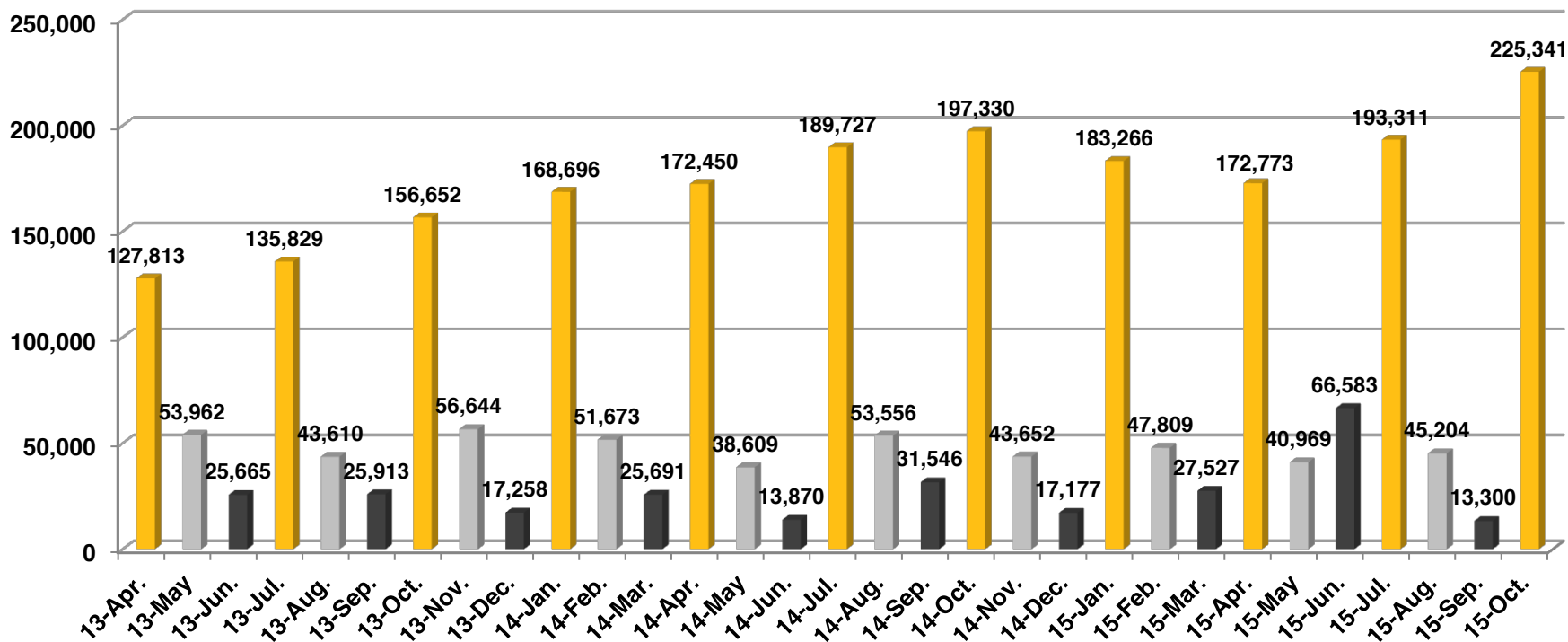
|         | Q215 | Q315 | Diff. |
|---------|------|------|-------|
| Pending | 181  | 187  | +6    |
| Issued  | 287  | 304  | +17   |
| Total   | 468  | 491  | +23   |



# 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<br>使用費 | 76   | 87   | 363  | 342  |

# 綜合損益表

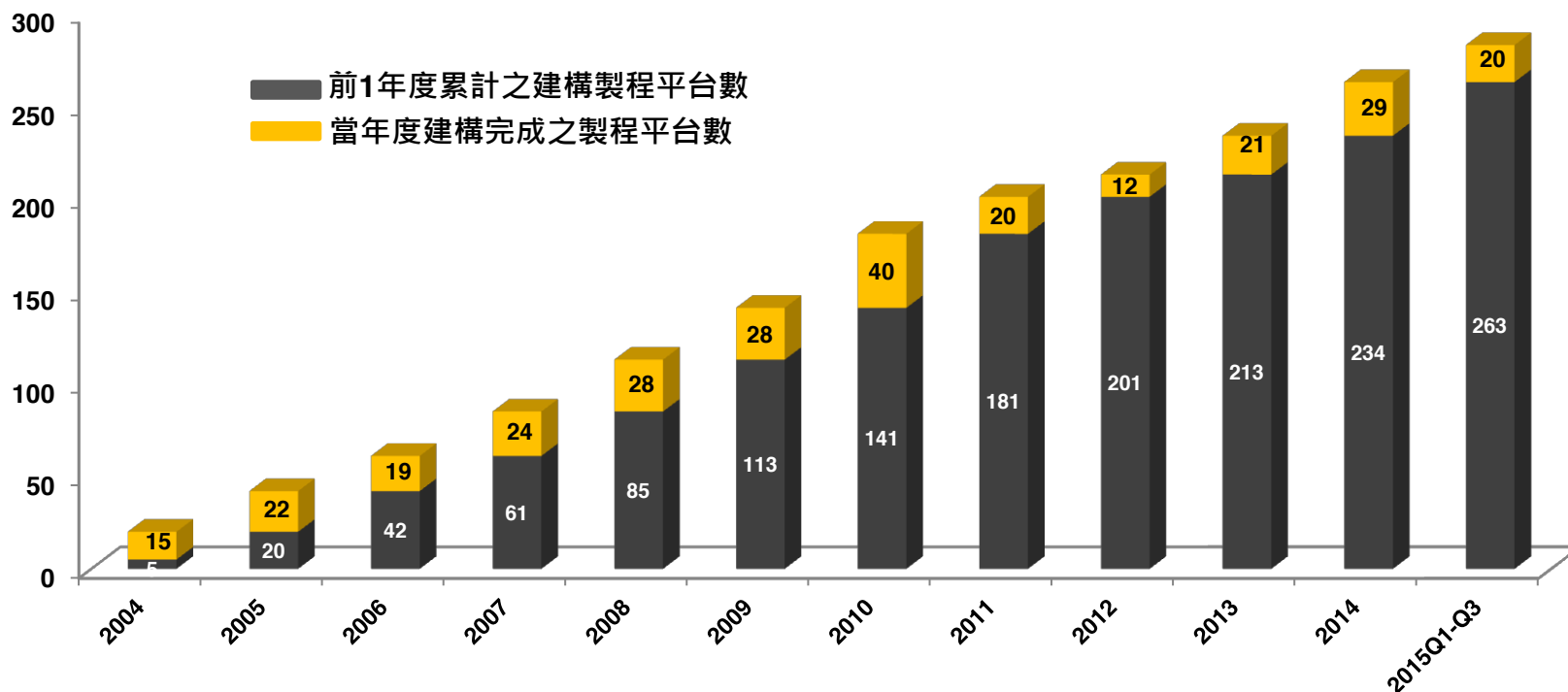
| (單位:新台幣仟元)         | Q315    | Q215    | % change | Q314    | % change |
|--------------------|---------|---------|----------|---------|----------|
| 營業收入淨額             | 251,815 | 280,325 | -10.17%  | 274,829 | -8.37%   |
| 營業毛利率              | 100%    | 100%    | -        | 100%    | -        |
| 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<br>(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~<br>0.13um | 0.15~<br>0.18um | >0.25<br>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

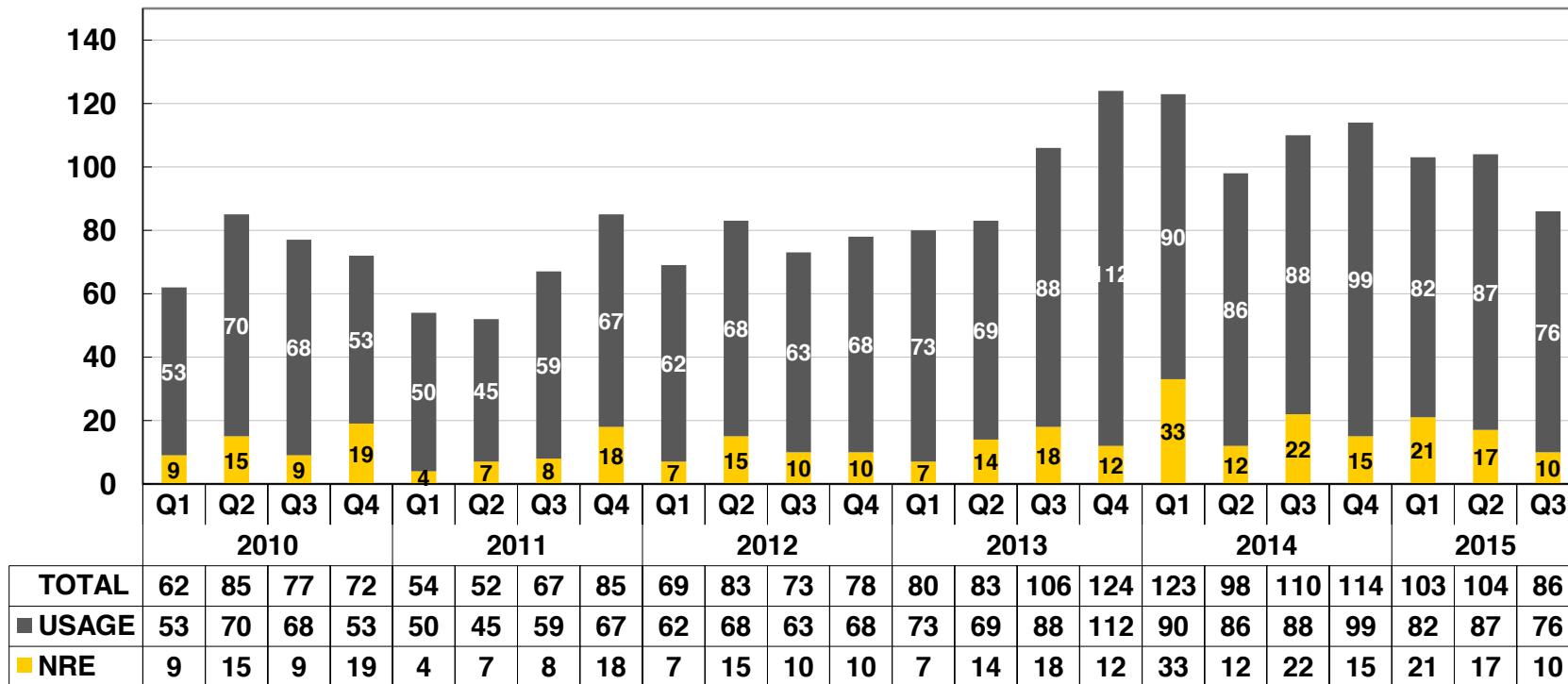
| 12" Fabs    | Production | Development | NVM Type        | Process Type                   |
|-------------|------------|-------------|-----------------|--------------------------------|
| 16nm        | 0          | 2           | OTP             | FF+                            |
| 28nm        | 4          | 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)

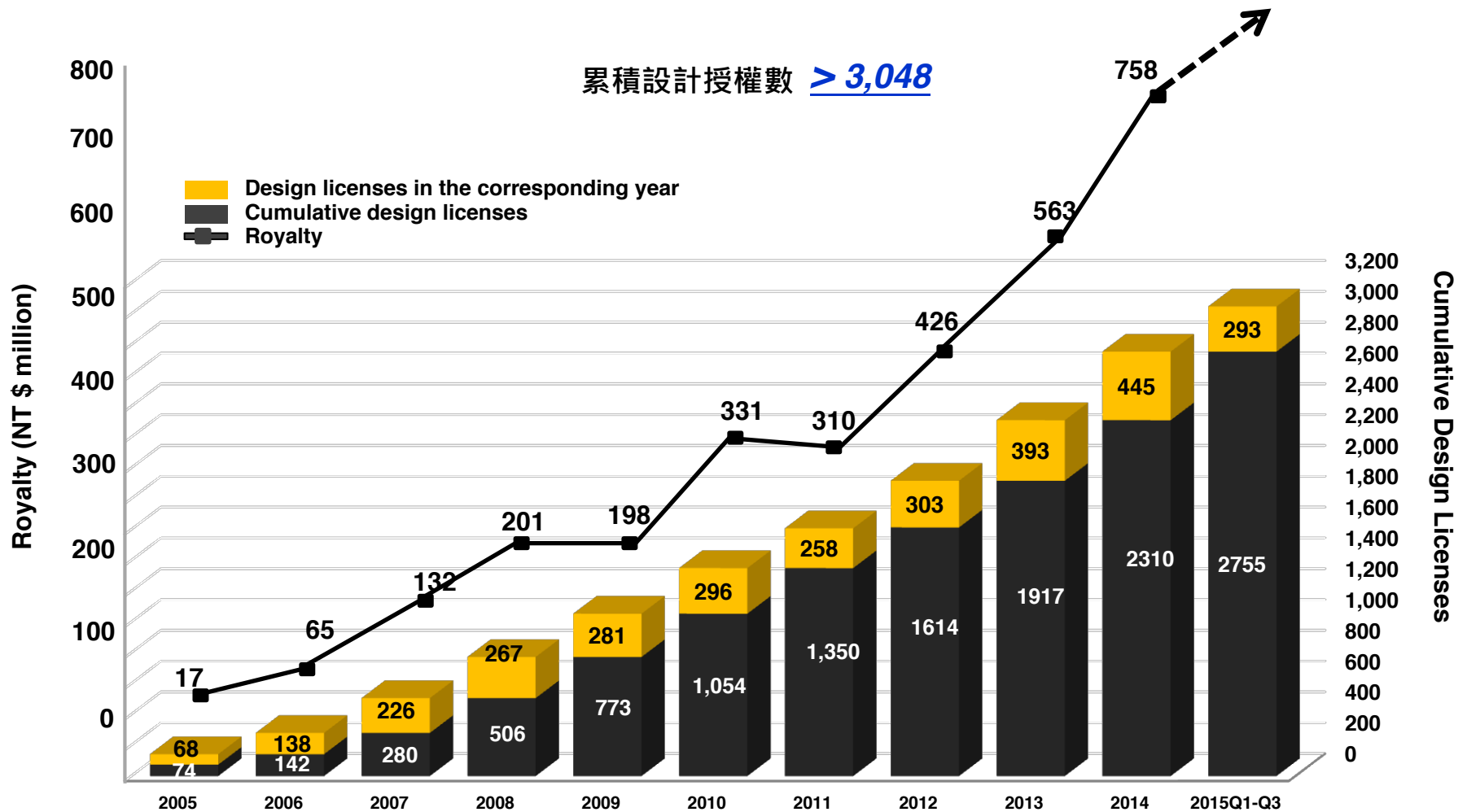
- Total **293** NTO as of Q3 2015 ( **445**@2014 **393**@2013, **303**@2012, **258**@2011)



**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

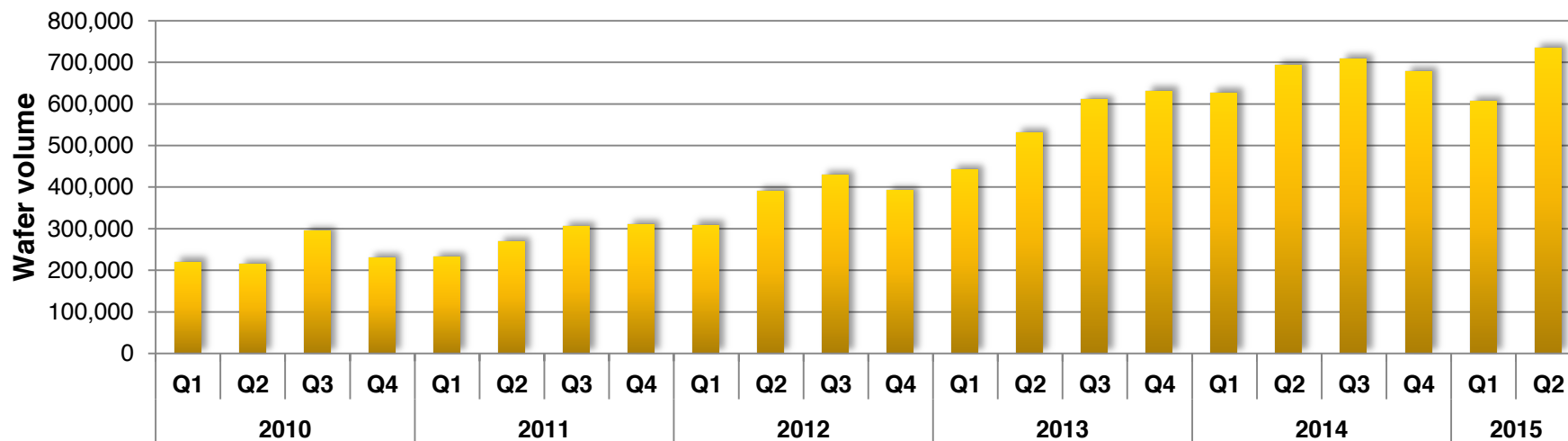


註1. 2009年因整體半導體景氣衰退，權利金年衰退1.5%。

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<br>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

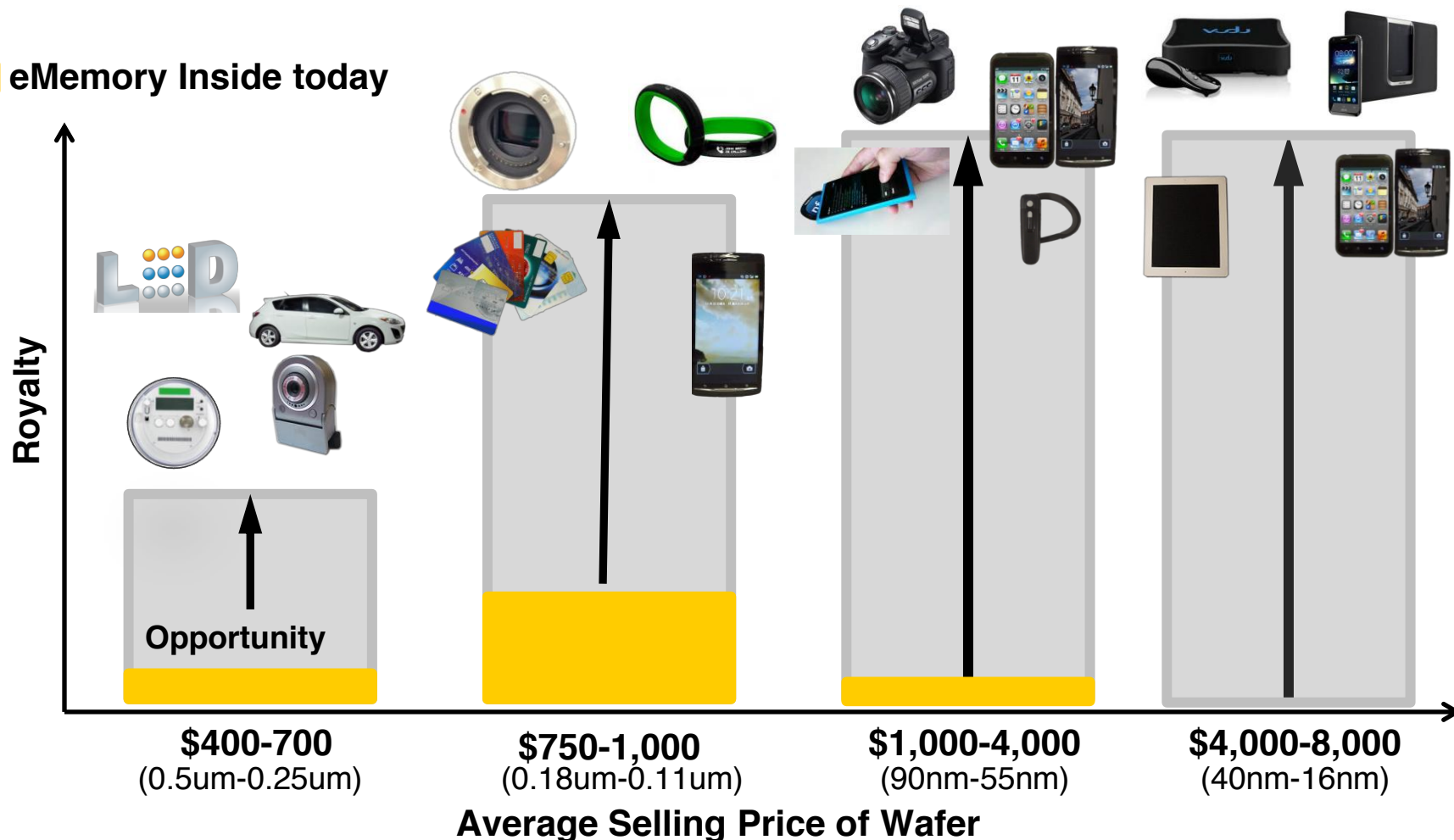
# NeoFlash

# NeoEE

# NeoMTP

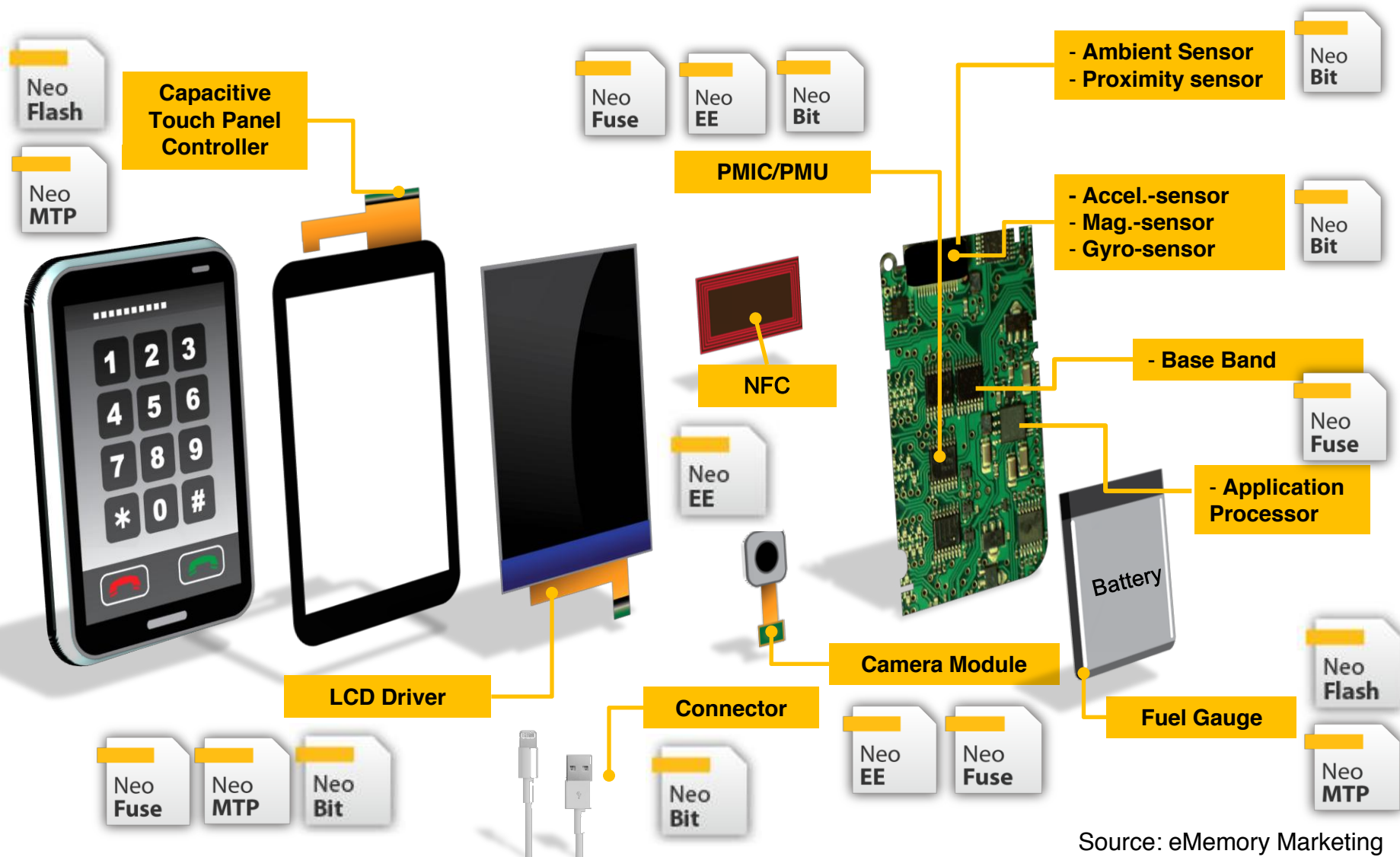
# 商機與潛力

 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

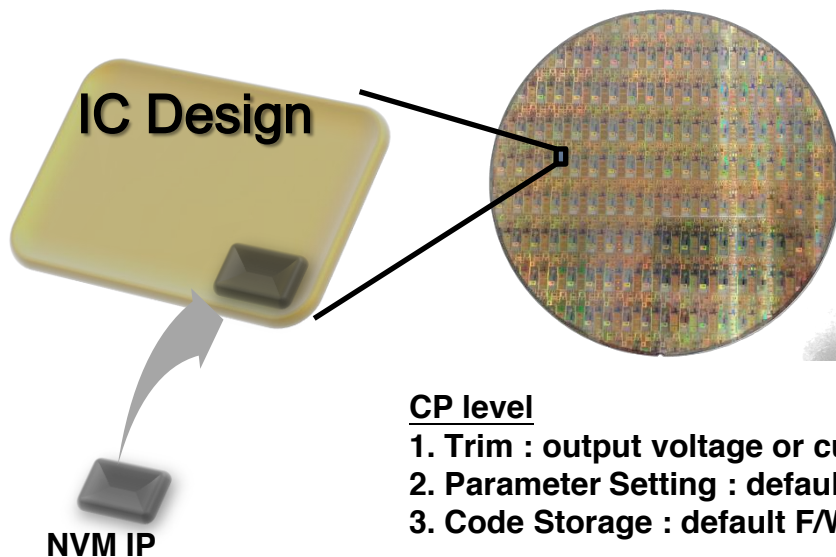
## Package/FT level

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

## CP Test

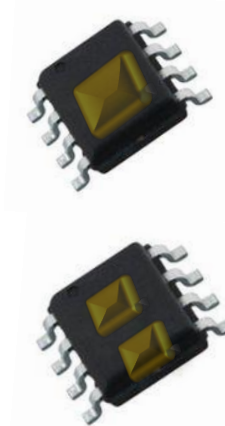
## Package/FT

## System Assembling



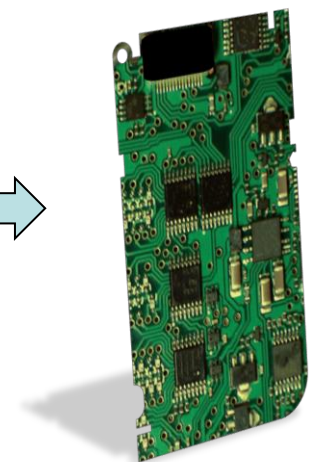
## CP level

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



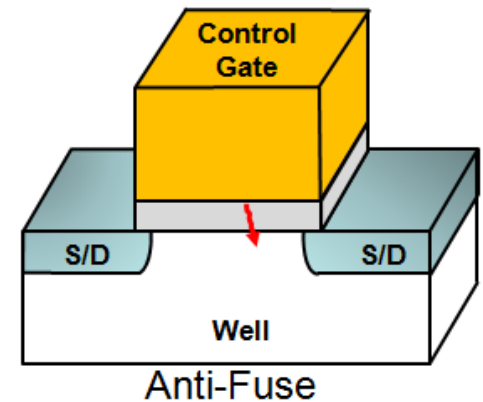
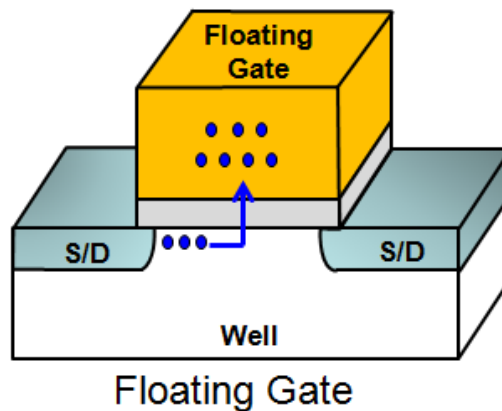
# 高機密性的安全設定

- 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



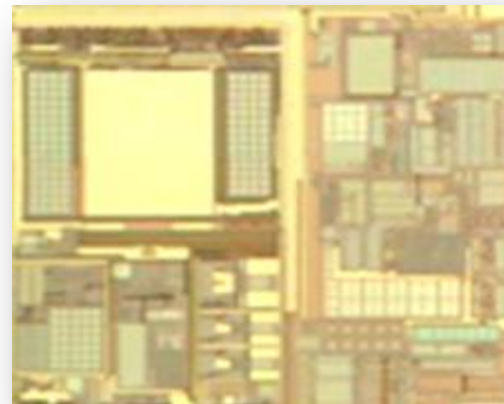
reverse  
copy

re-produce



without protection

## Fake Product

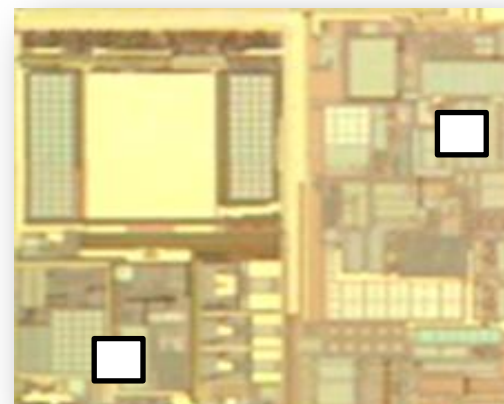


reverse  
copy

re-produce



with protection

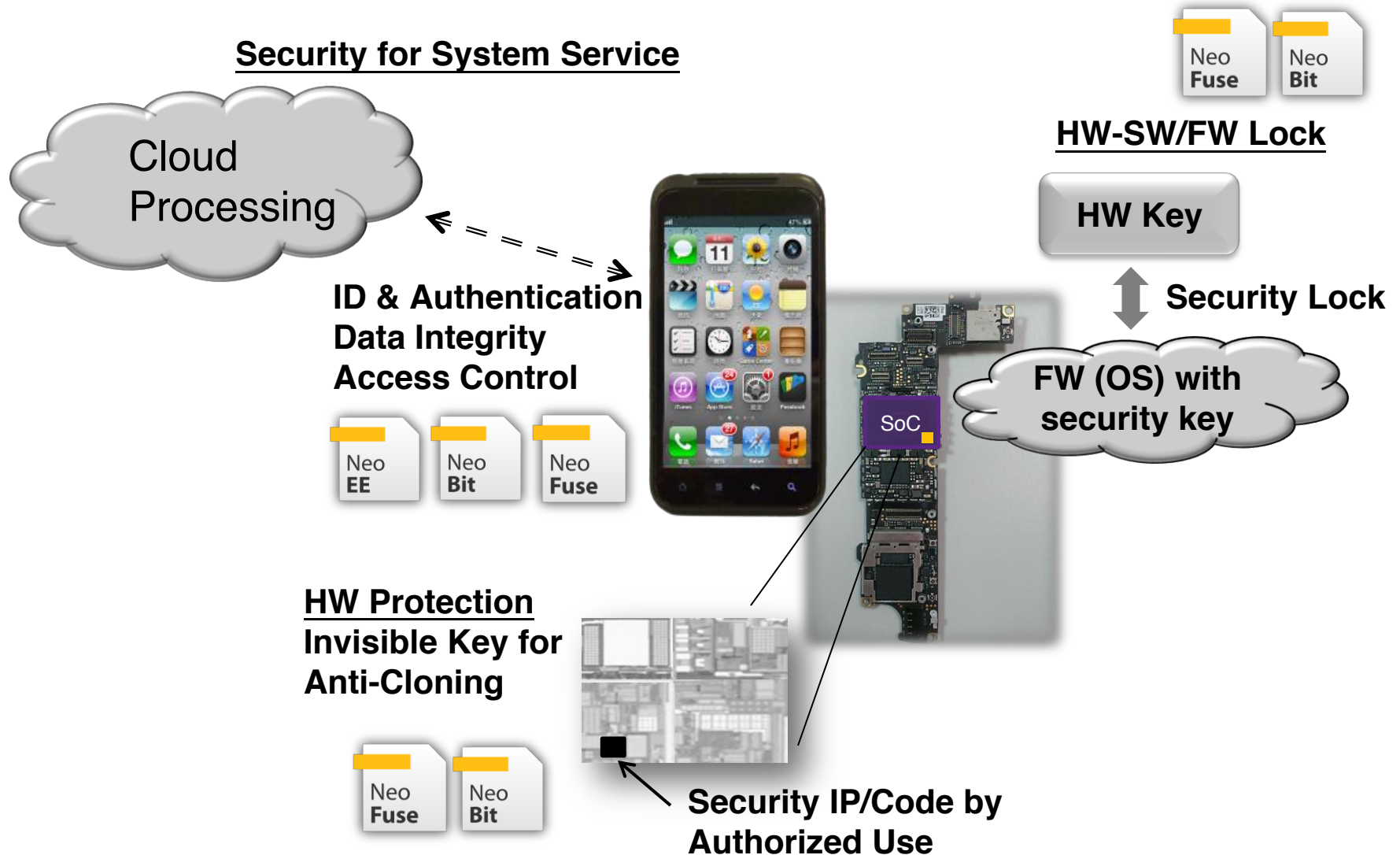


**Security IP/Code by  
Authorized Use**

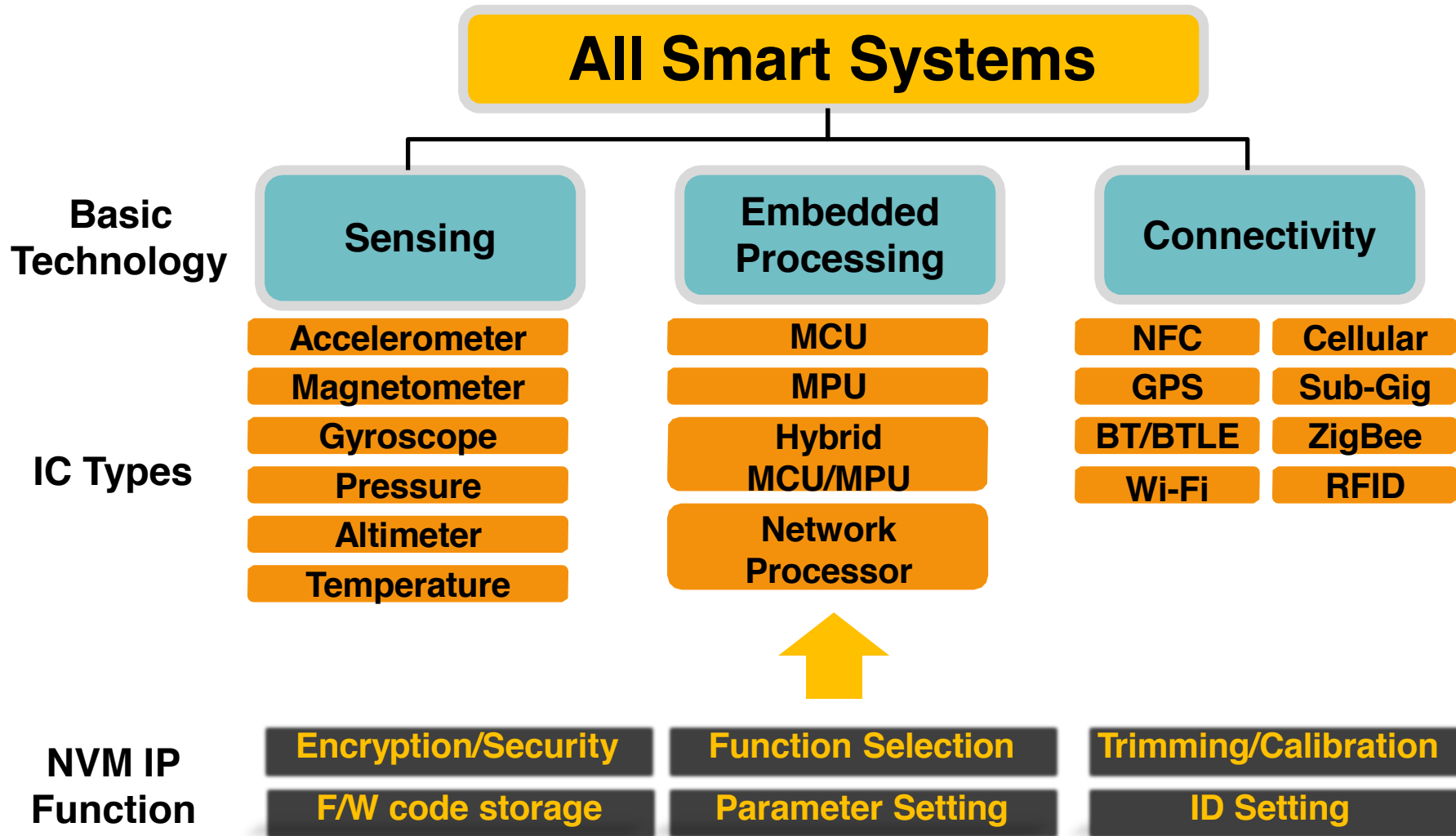
**Can NOT Work w/o  
Security IP/Code**



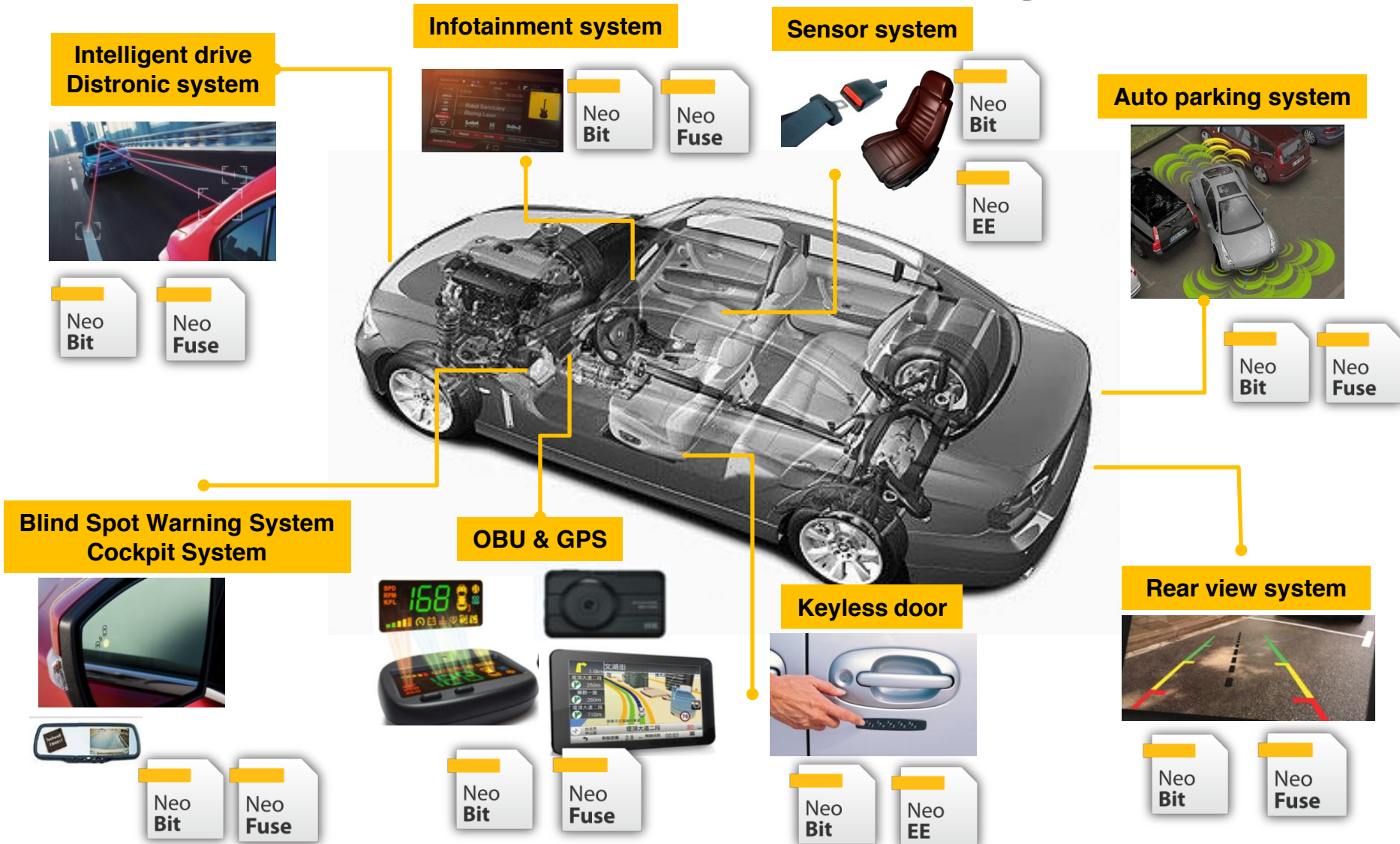
# 力旺矽智財引領高安全性應用



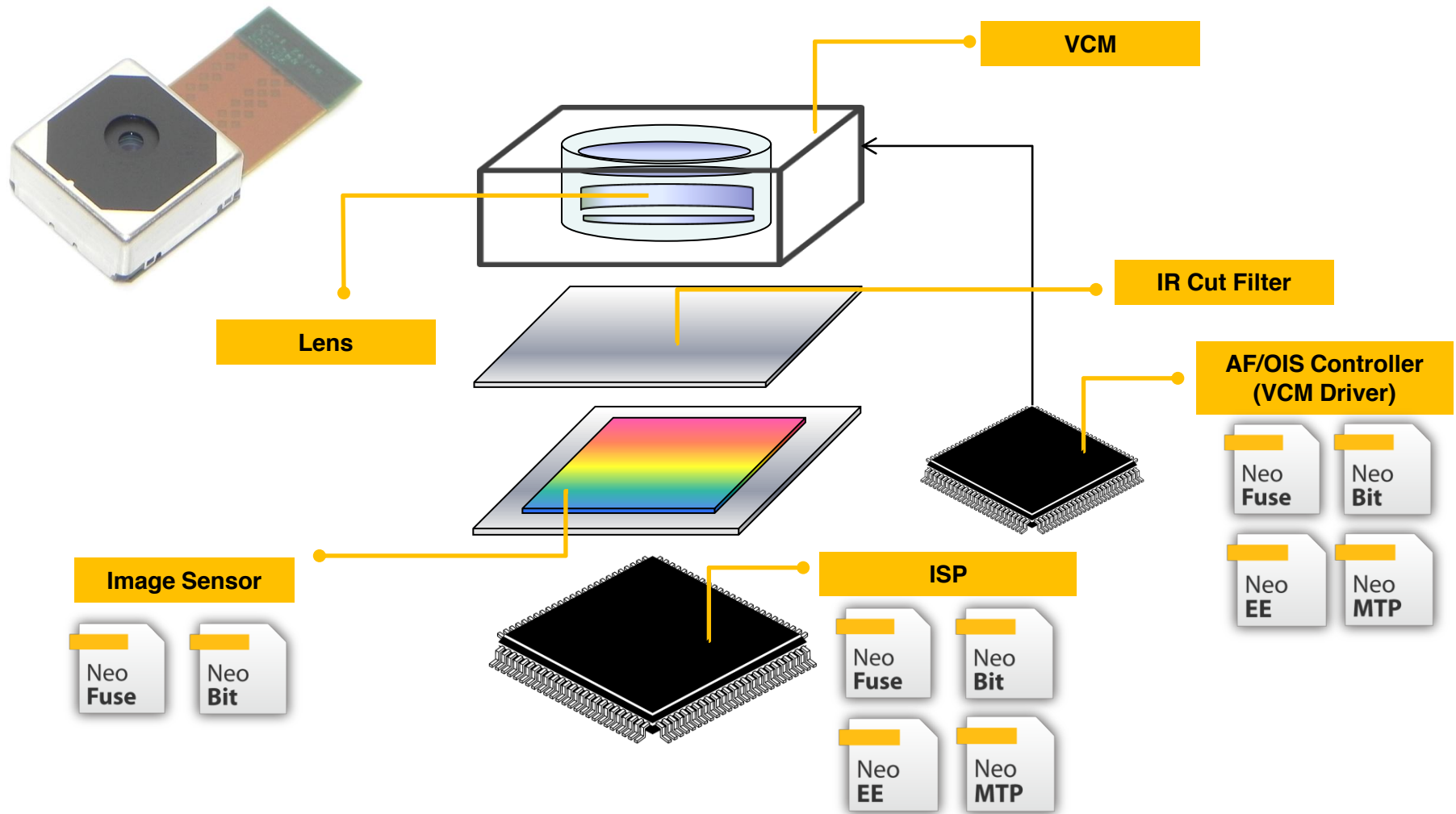
# 在IoT中之NVM IP 需求



# Autotronics with eMemory IPs



# Imager Module with eMemory IPs



# 先進液晶顯示驅動晶片

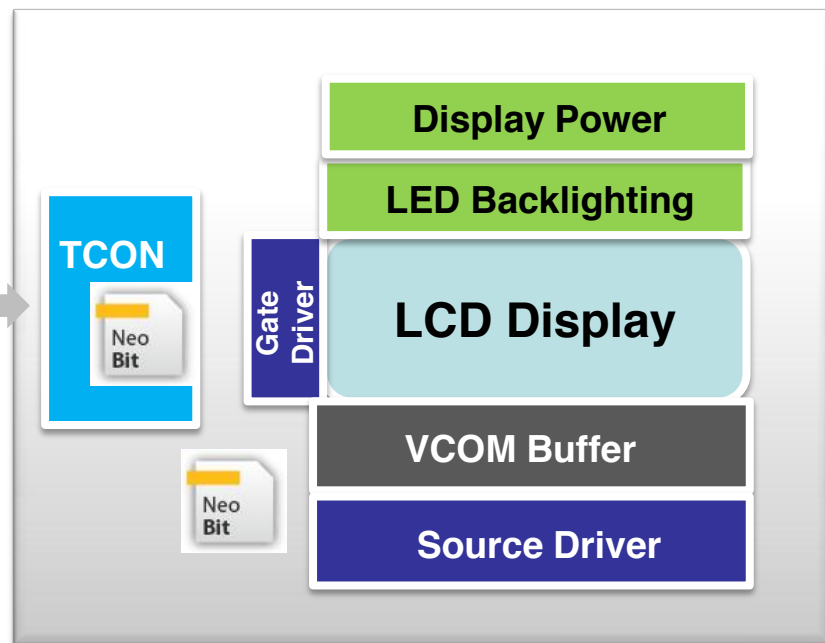
Process Technology : 0.11um HV/80nm HV/55nm HV



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



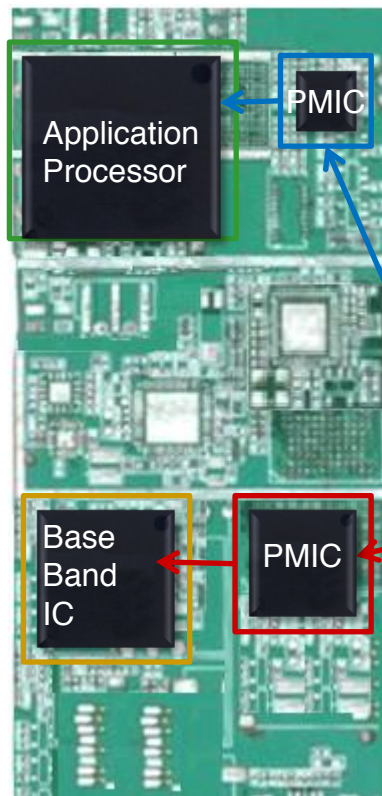
DDI



| Density | Endurance | NVM Type | Purpose      | NVM Usage                                                                                                                                           |
|---------|-----------|----------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| 2K8~4K8 | 1         | OTP      | Trimming     | <ol style="list-style-type: none"> <li>1. Accuracy enhancement</li> <li>2. Mismatch cancellation</li> </ol>                                         |
|         |           |          | Code Storage | <ol style="list-style-type: none"> <li>1. Gamma Correction Table</li> <li>2. Timing Control Pattern</li> <li>3. Color Engine Enhancement</li> </ol> |

# 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**

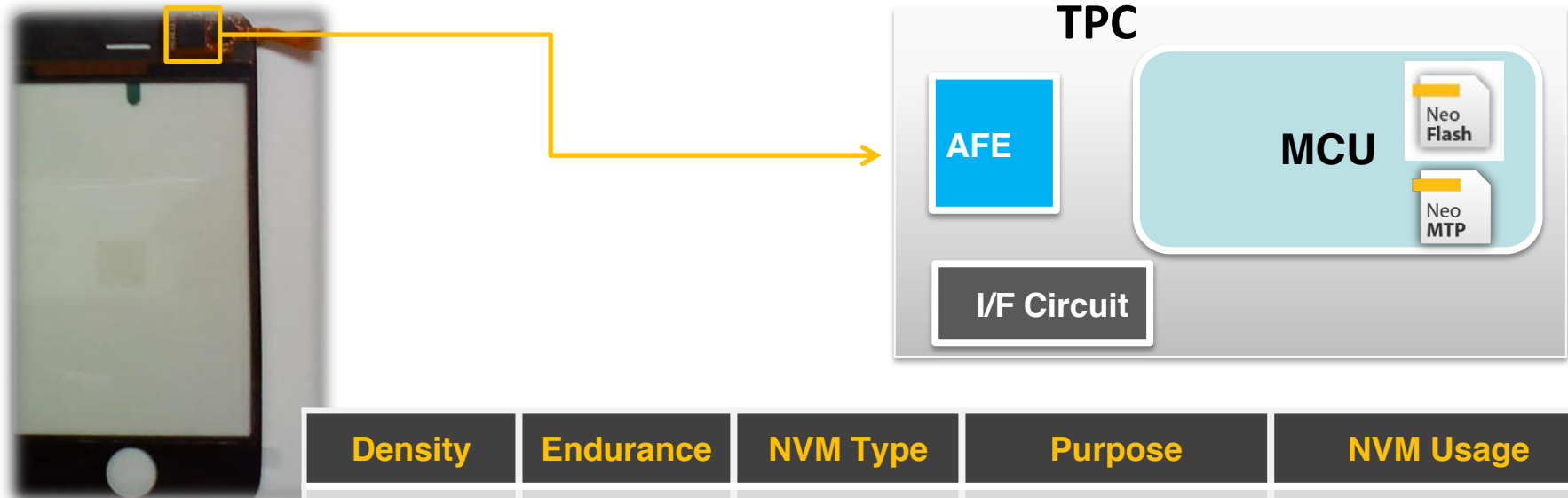


| Density | NVM Type | Purpose           | NVM Usage                                        |
|---------|----------|-------------------|--------------------------------------------------|
| 2Kb~4Kb | OTP      | Trimming          | DC/DC, Bandgap                                   |
|         |          | 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

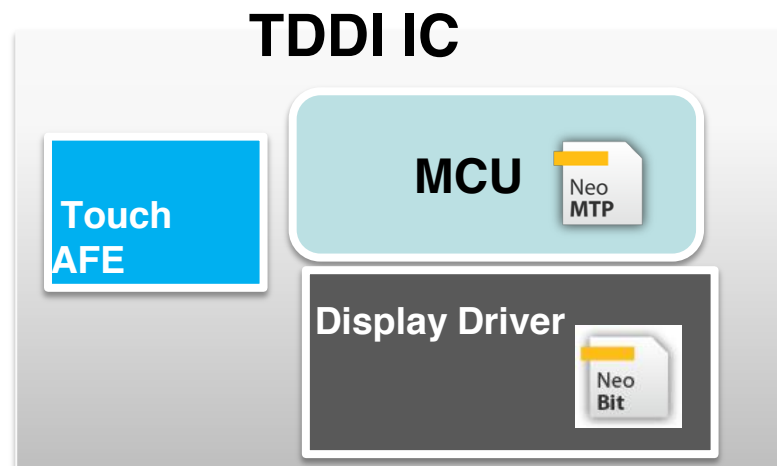


| Density   | Endurance | NVM Type | Purpose           | NVM Usage                                     |
|-----------|-----------|----------|-------------------|-----------------------------------------------|
| 16K8~32K8 | <1000     | MTP      | Code Storage      | F/W code                                      |
|           |           |          | Parameter setting | Customized model and performance optimization |



# 內嵌式觸控面板控制器晶片

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

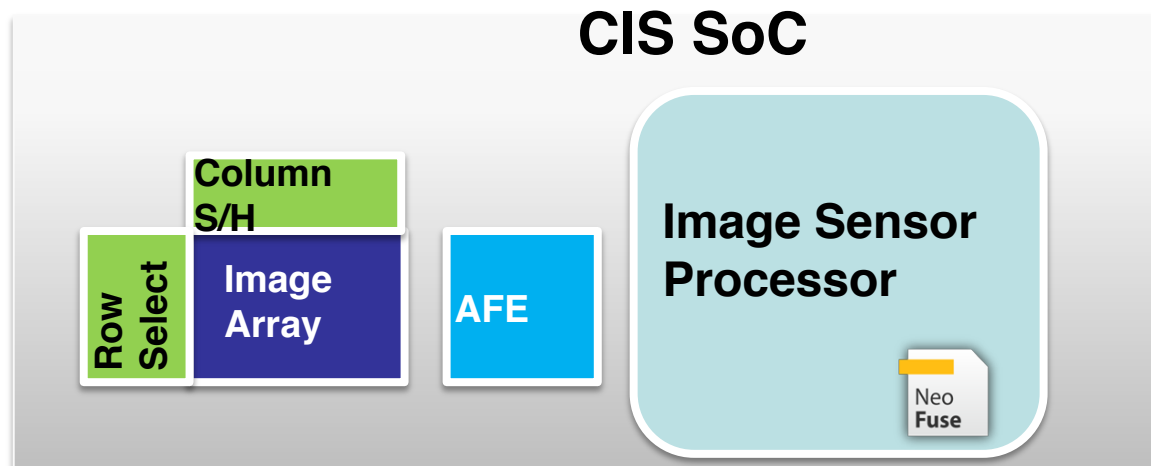
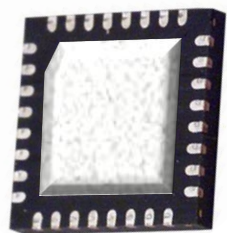


| Density   | Endurance | NVM Type | Purpose           | NVM Usage                |
|-----------|-----------|----------|-------------------|--------------------------|
| 2K8~4K8   | 1         | OTP      | Trimming          | Accuracy                 |
|           |           |          | Code Storage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



# CMOS 影像感測器

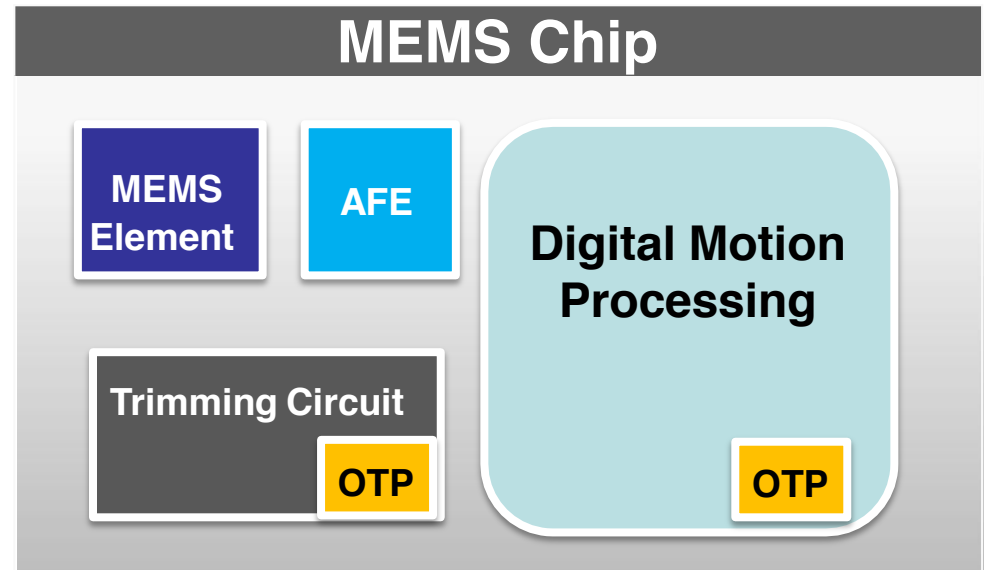
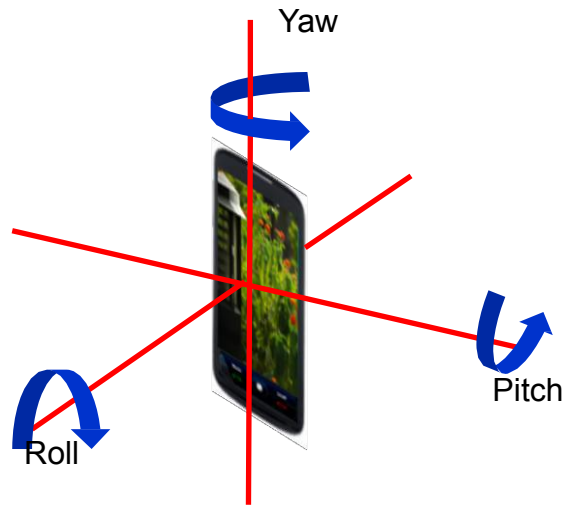
Process Technology : 0.11um CIS/90nm CIS/65nm CIS



| 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

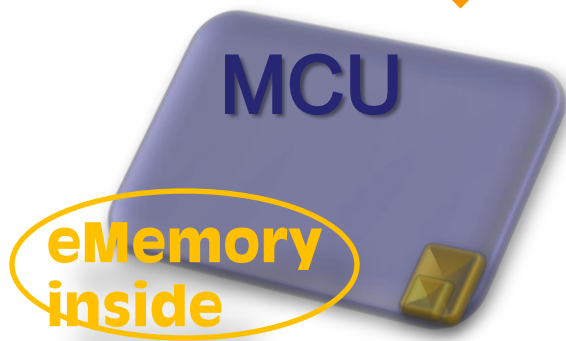


product design & manufacturing by  
embedded Flash  
Logic Process + 10 Masks



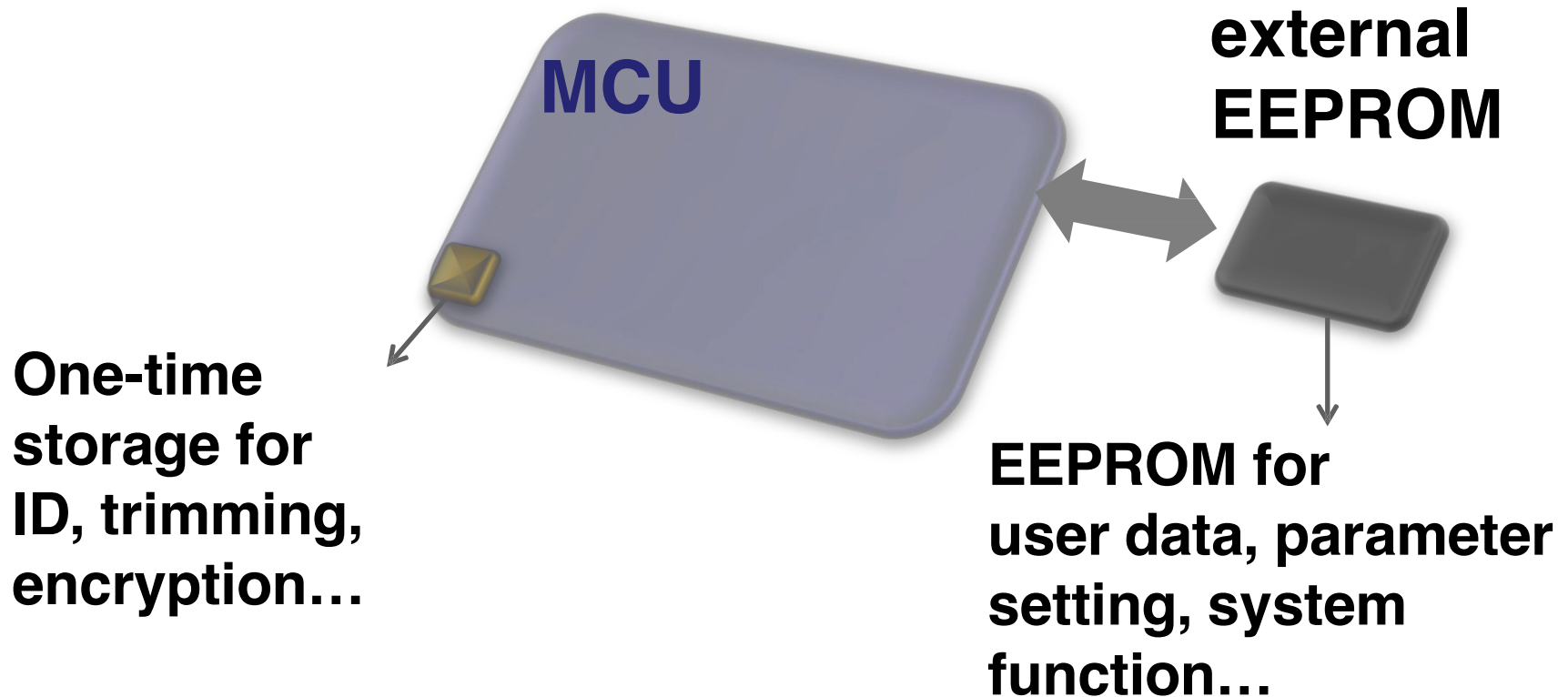
***30% more  
cost reduction***

***wafer cost &  
testing time***



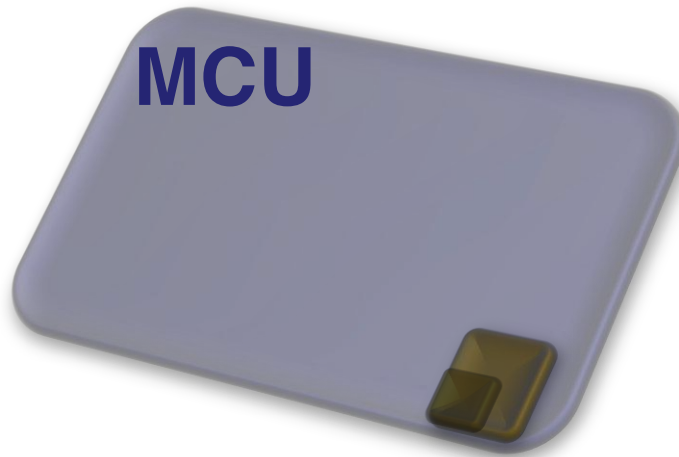
product design & manufacturing by  
Embedded Logic NVM (OTP/MTP)  
Logic Process

# 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

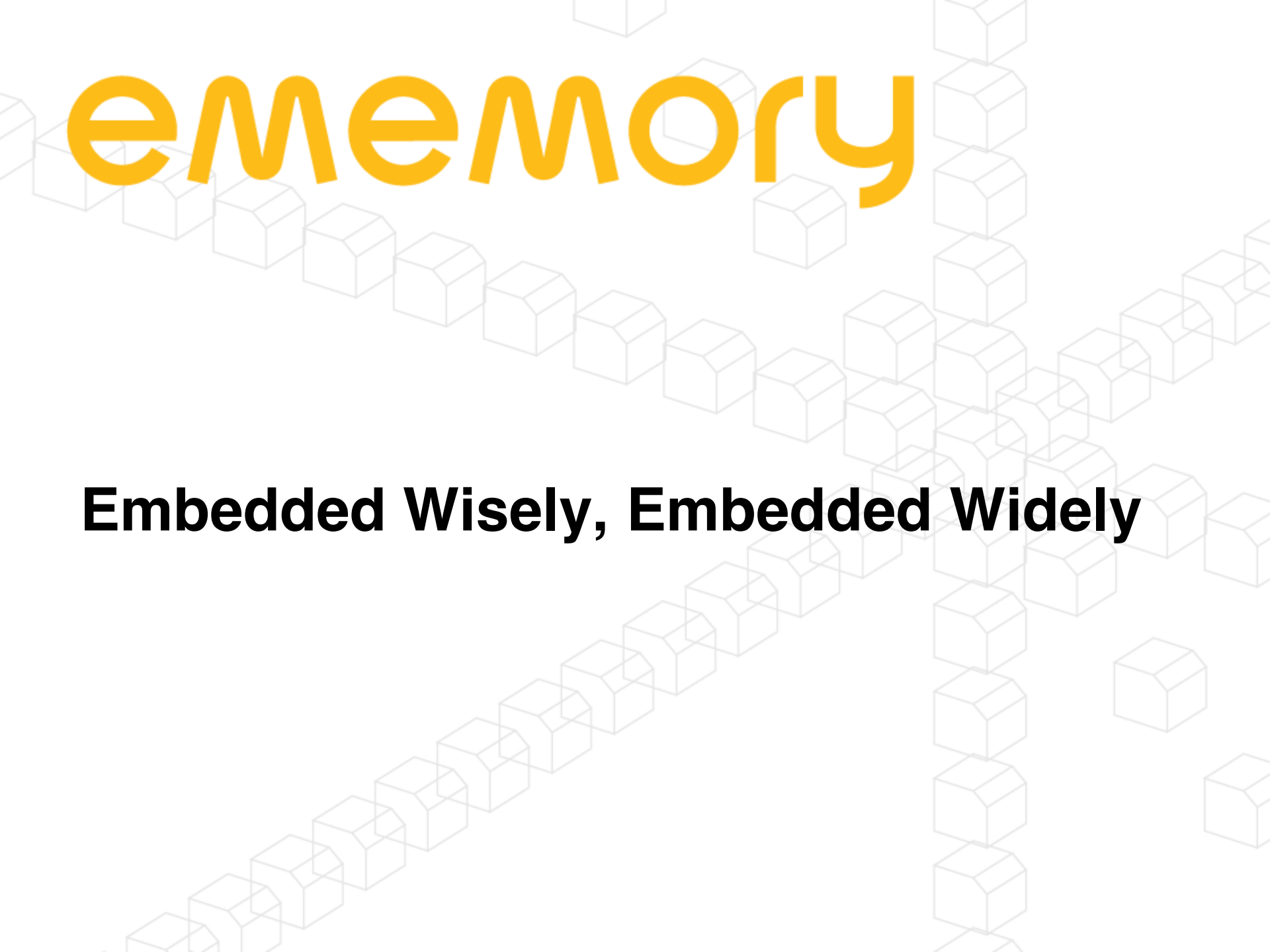
- Higher royalty per wafer is contributed from more advanced technology nodes.

## Great IoT era

- Embedded Logic NVM will be a must.



# Q & A



# ememory

**Embedded Wisely, Embedded Widely**