

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**

**June, 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。

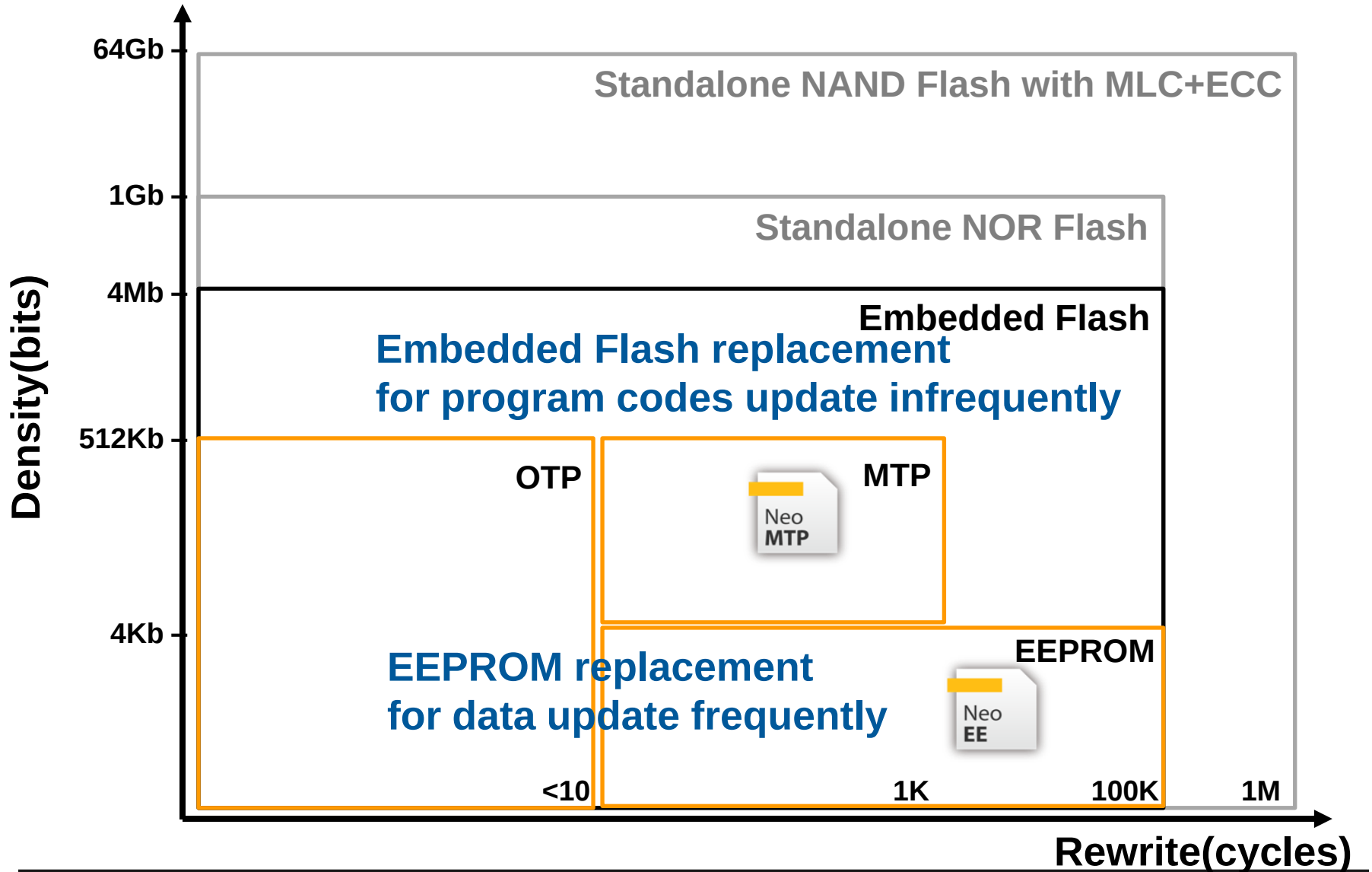
# 投資安全聲明

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

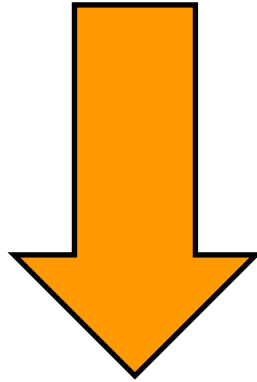
- 公司營運模式
- 營運回顧
- 成長機會與未來展望
- 問題與回答

# 嵌入式非揮發性記憶體分類



# 何謂 Logic Non-Volatile Memory

**Embedded NVM = LOGIC + 10 Masks**



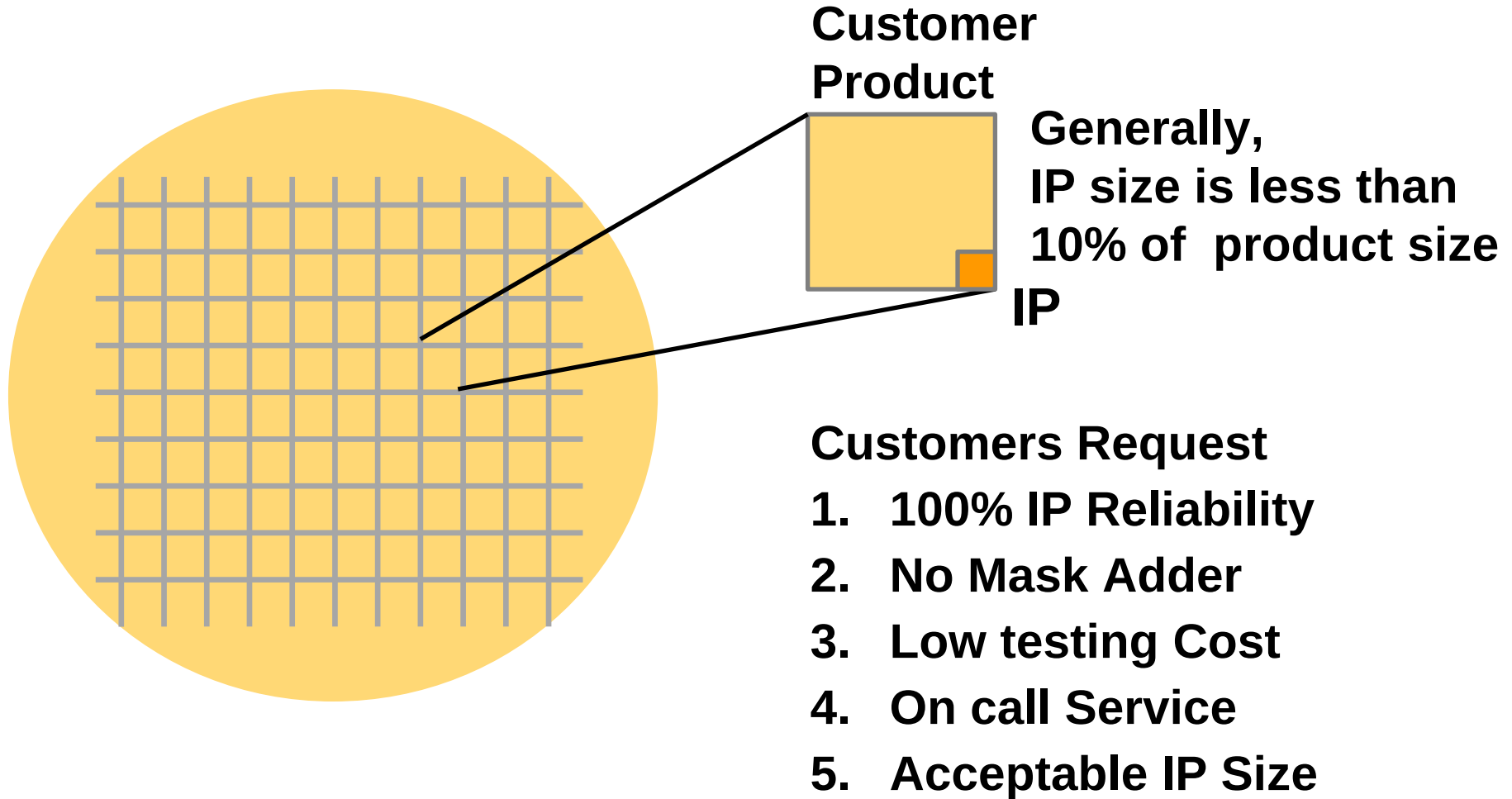
*30% more  
cost reduction*

**Embedded LOGIC NVM = LOGIC**

# 嵌入式非揮發性記憶體技術

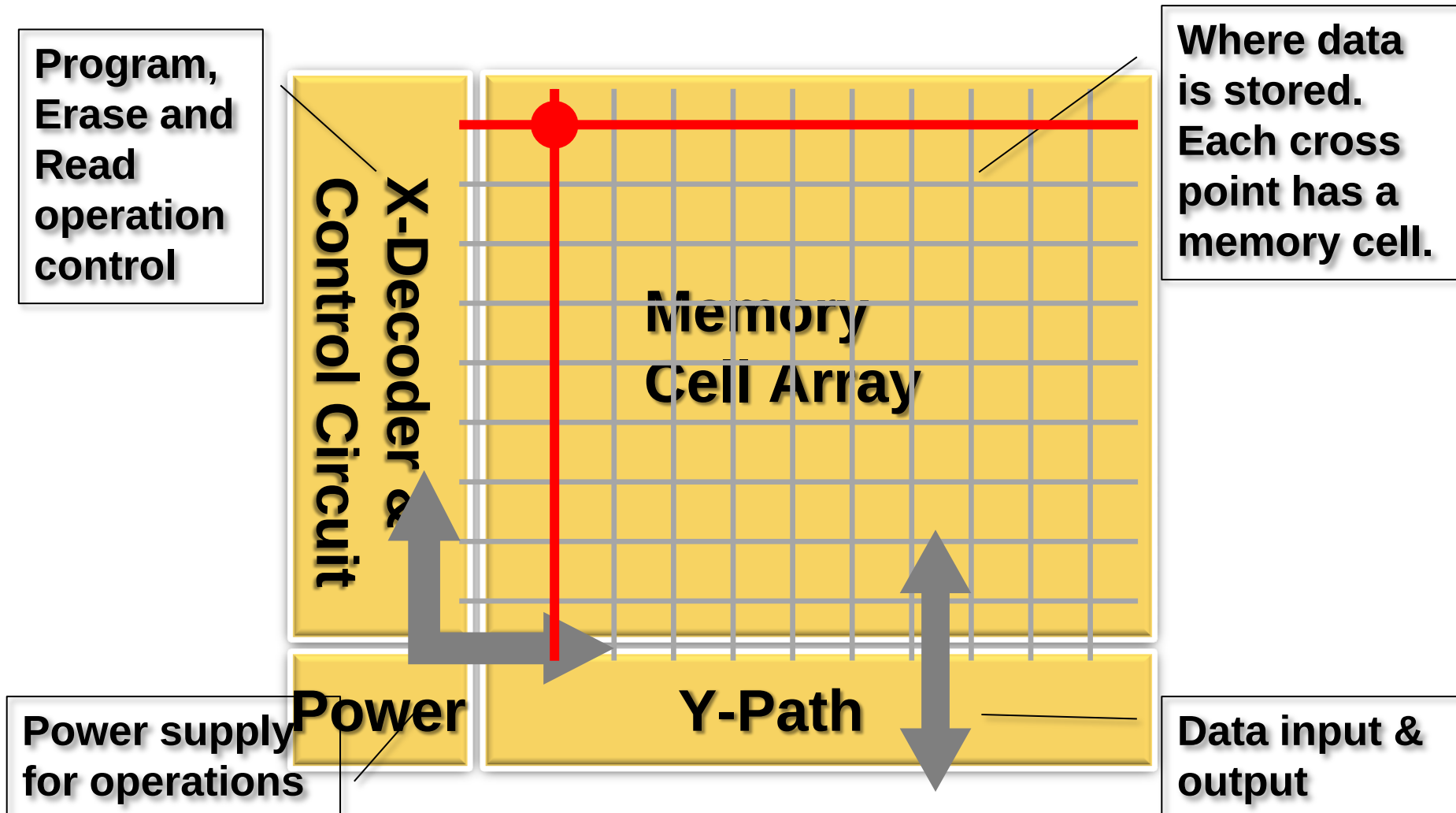
|                          | ROM        | eFuse (OTP) | Antifuse (OTP) | CMOS Floating Gate (OTP) | CMOS Floating Gate (MTP) | Embedded Flash |
|--------------------------|------------|-------------|----------------|--------------------------|--------------------------|----------------|
| Cell Structure           | 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



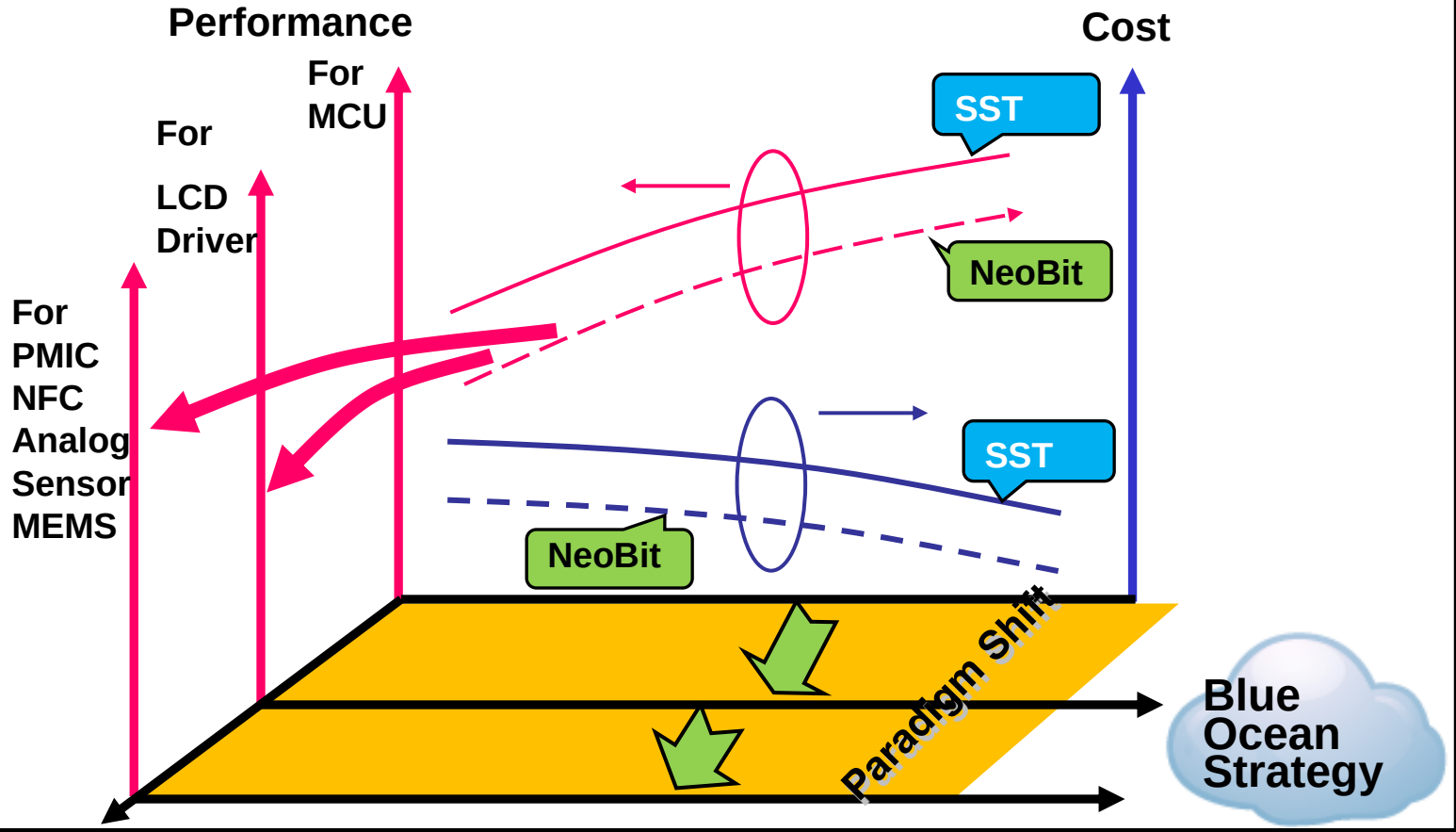


# Nonvolatile Memory IP 内部

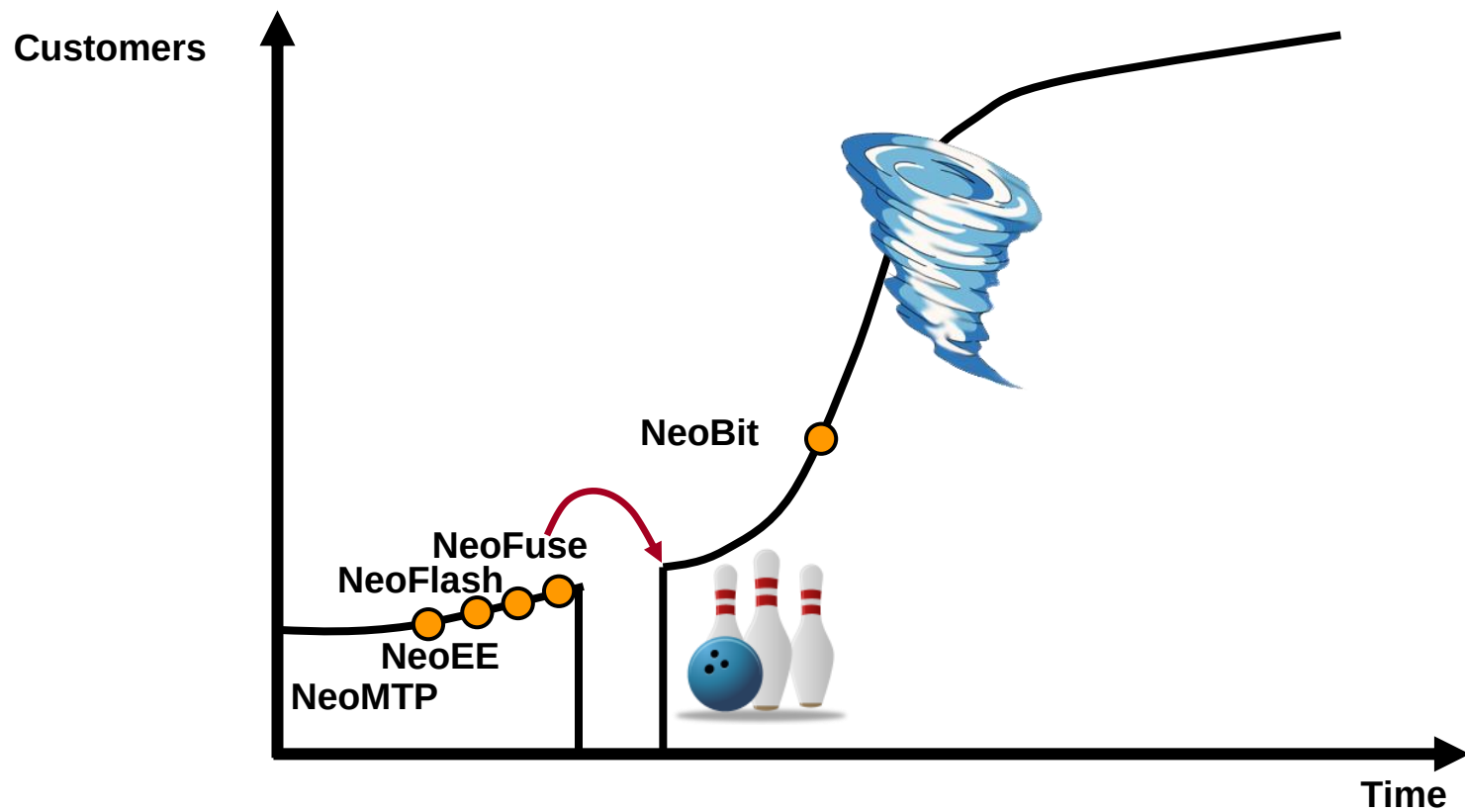


# 破壞性創新

● *Innovation, Innovation, and Innovation !*

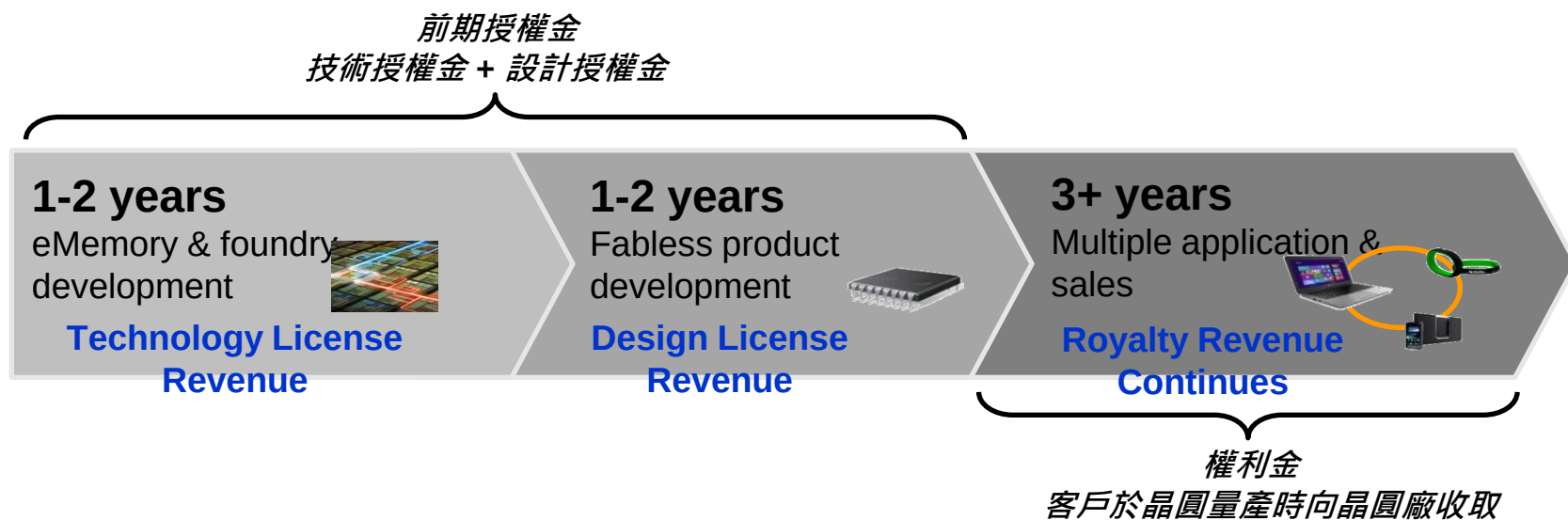


# 跨越鴻溝



# 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，219位員工，148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



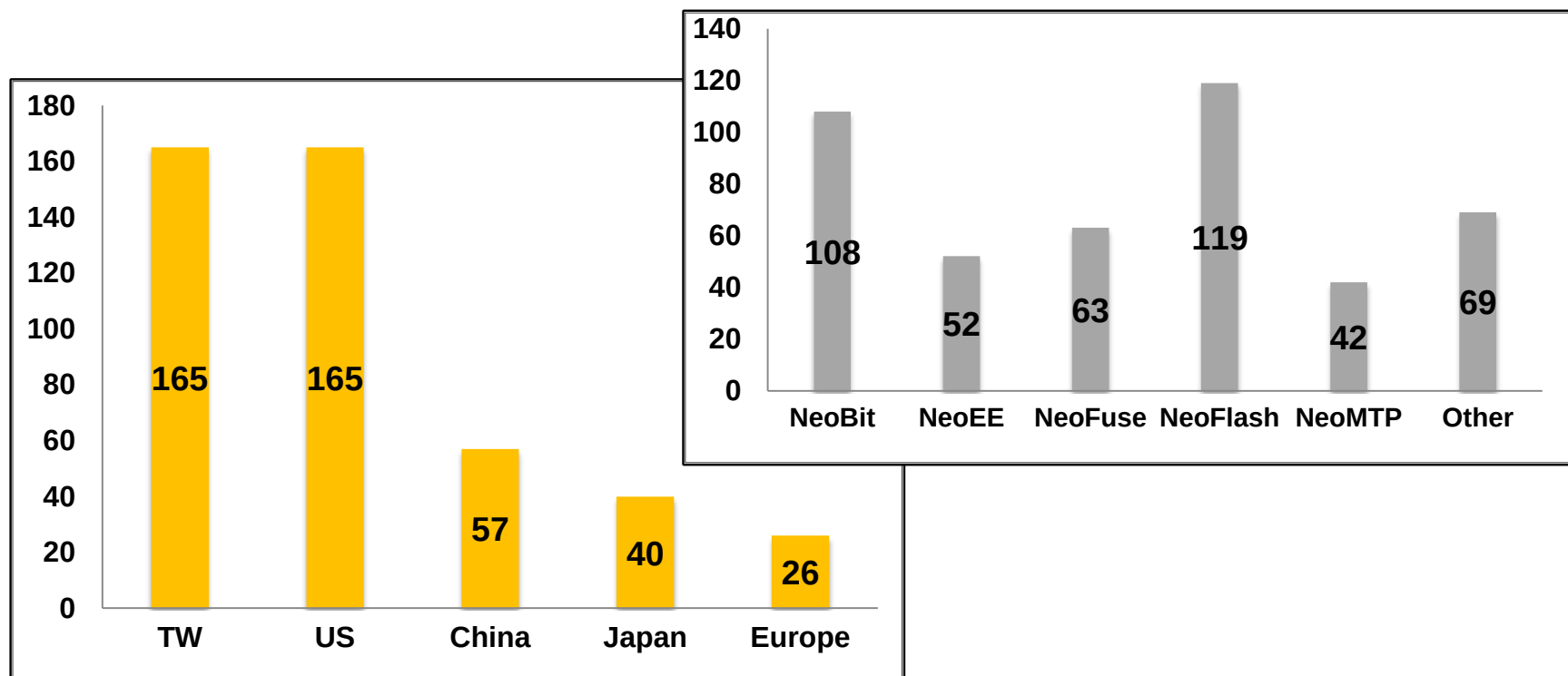
## IDM



|         | 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

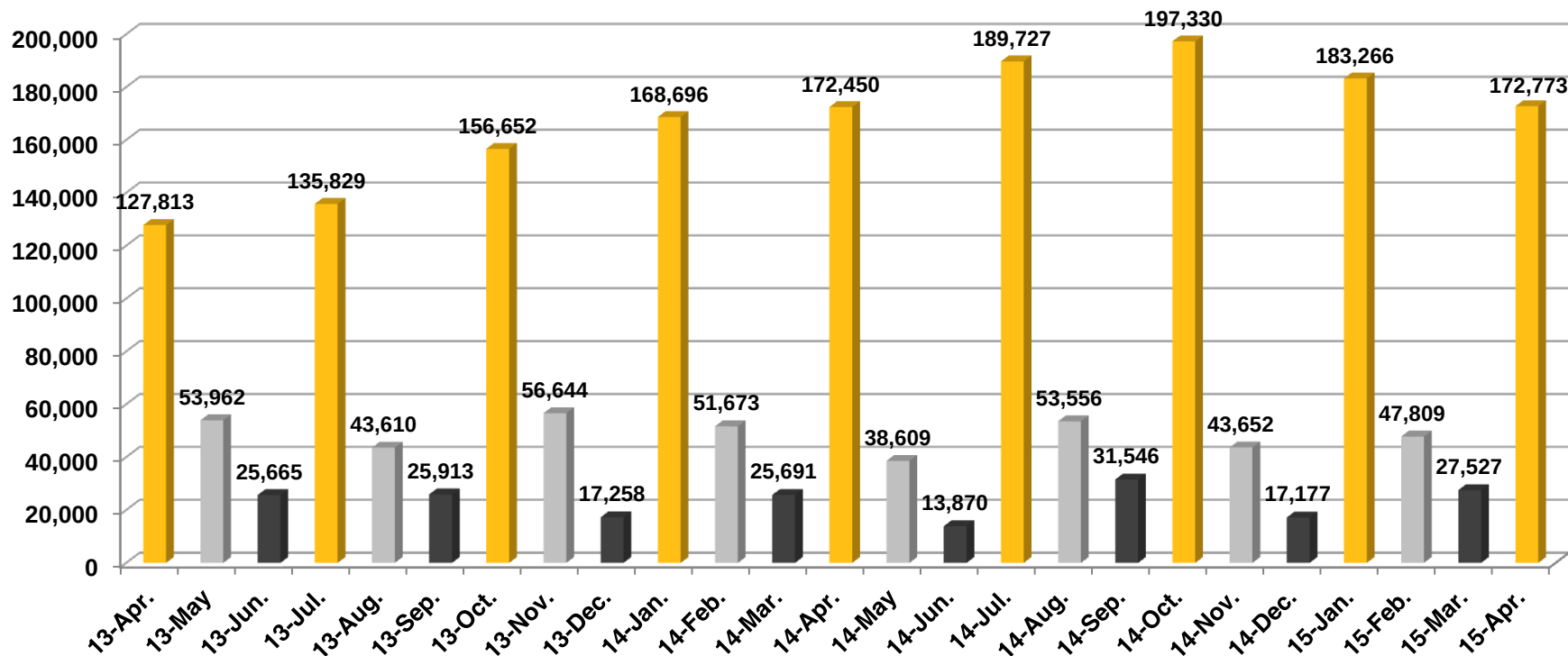
|         | 4Q14 | 1Q15 | Diff. |
|---------|------|------|-------|
| Pending | 166  | 175  | +9    |
| Issued  | 269  | 278  | +9    |
| Total   | 435  | 453  | +18   |



# 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

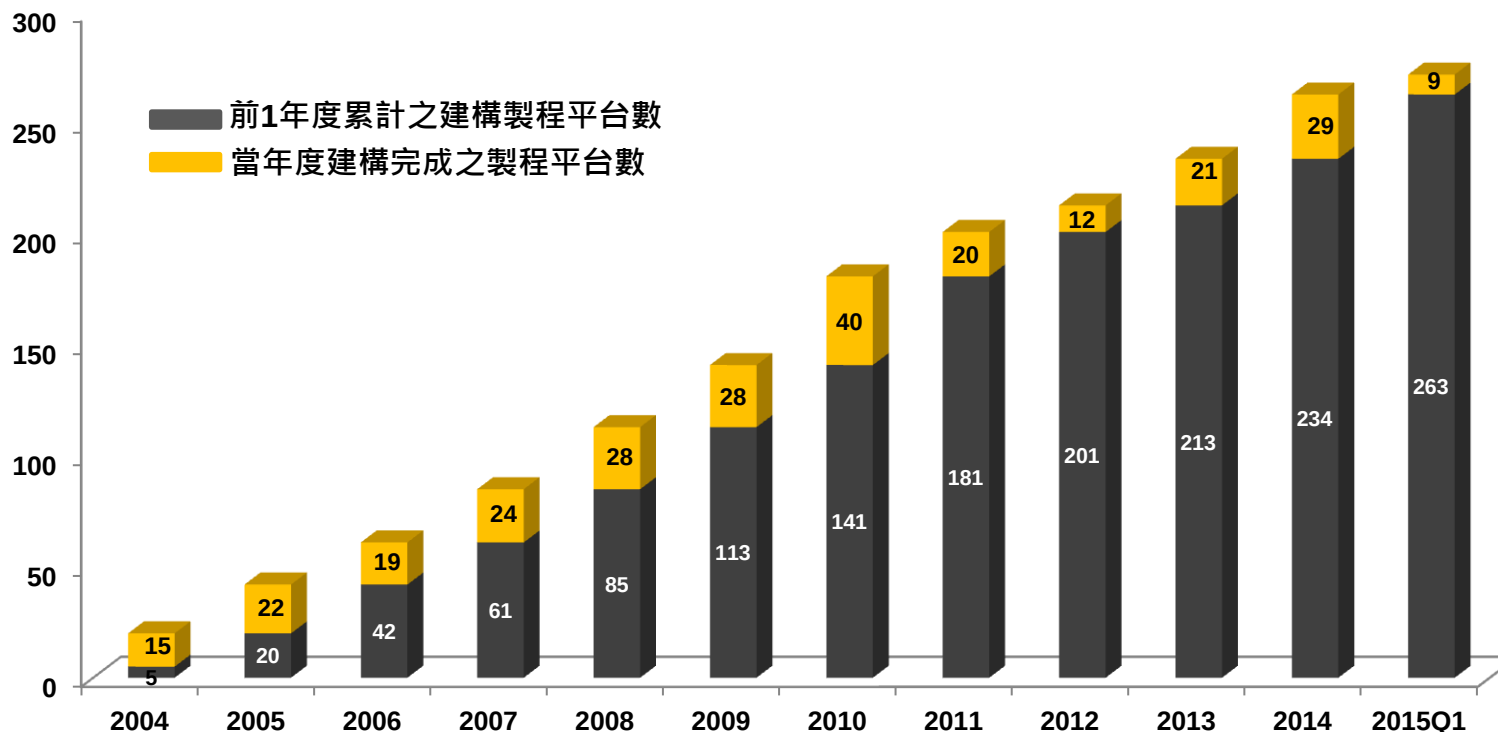
| (Unit: NTD thousands) | 1Q15    | 4Q14    | % change | 1Q14    | % change |
|-----------------------|---------|---------|----------|---------|----------|
| Revenue               | 258,602 | 258,159 | 0.2%     | 246,060 | 5.1%     |
| Gross Margin          | 100%    | 100%    | -        | 100%    | -        |
| 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~<br>0.13um | 0.15~<br>0.18um | >0.25<br>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

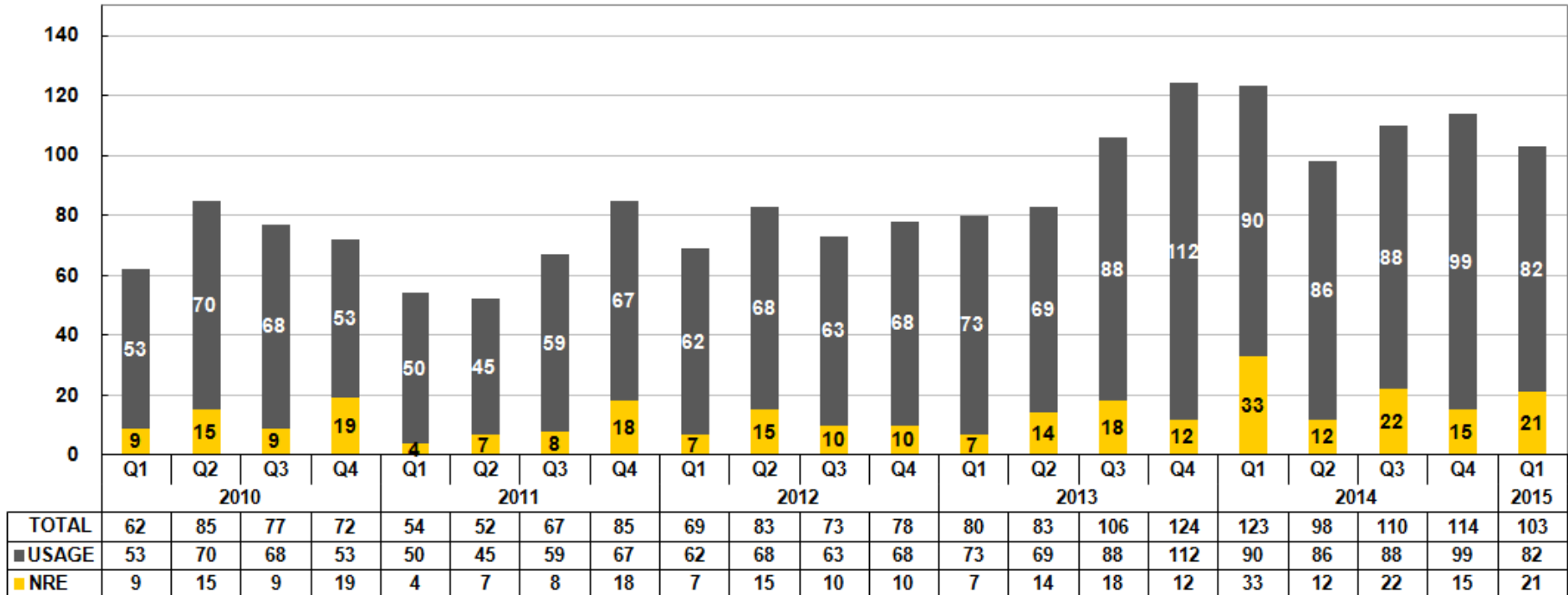
| 12" Fabs    | Production | Development | NVM Type        | Process Type                   |
|-------------|------------|-------------|-----------------|--------------------------------|
| 16nm        | 0          | 1           | OTP             | FF+                            |
| 28nm        | 2          | 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)

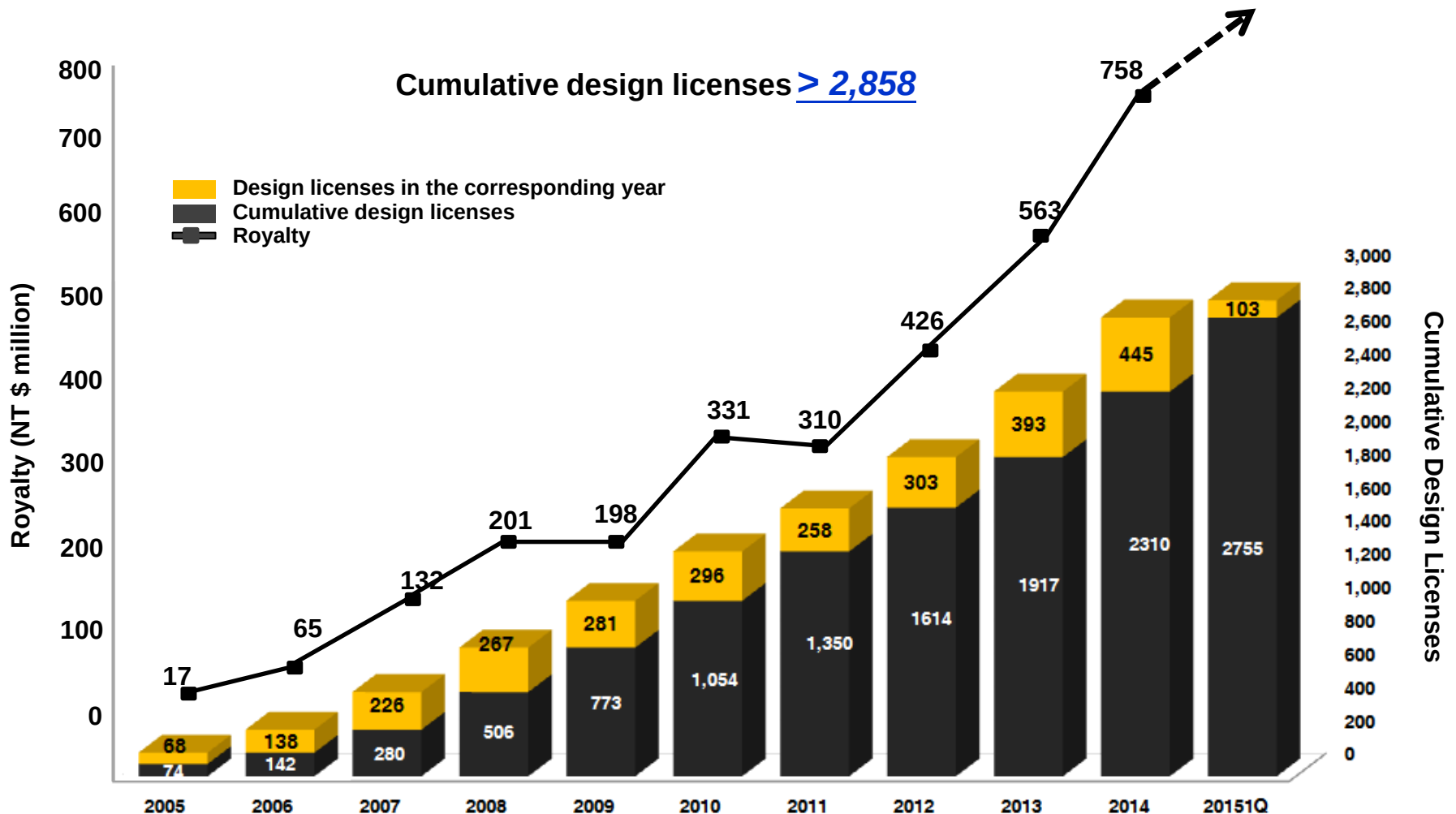
- Total **103** NTO as of 1Q 2015 ( **445**@2014 **393**@2013, **303**@2012, **258**@2011)



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

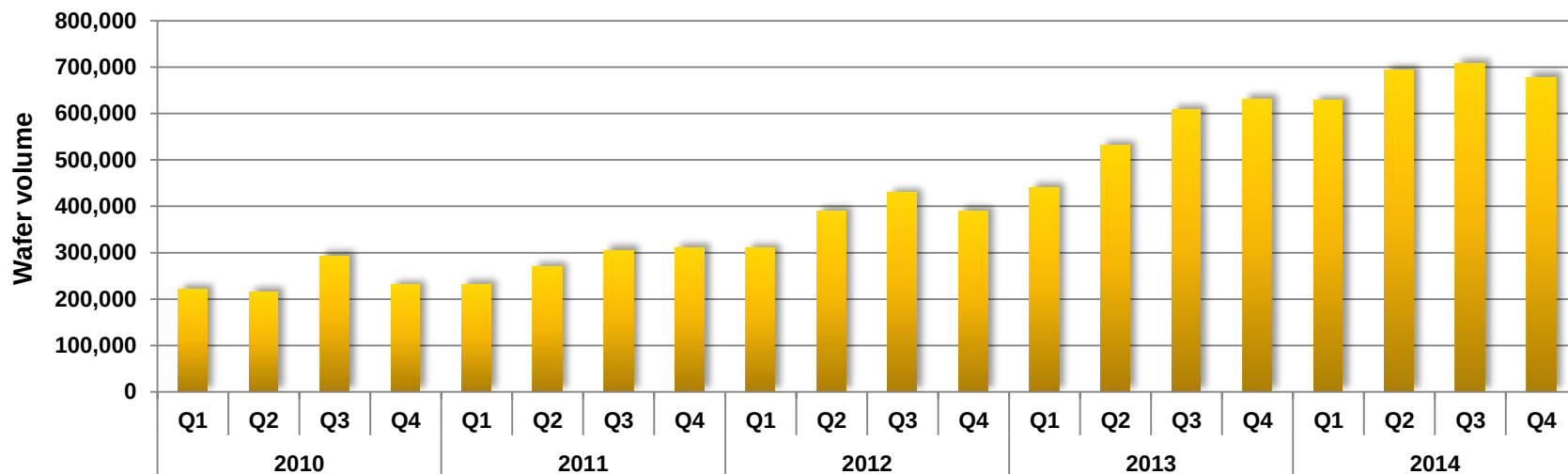


note 1: Due to the 2009 recession, royalty income was down annually 1.5%.

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<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

Confidential

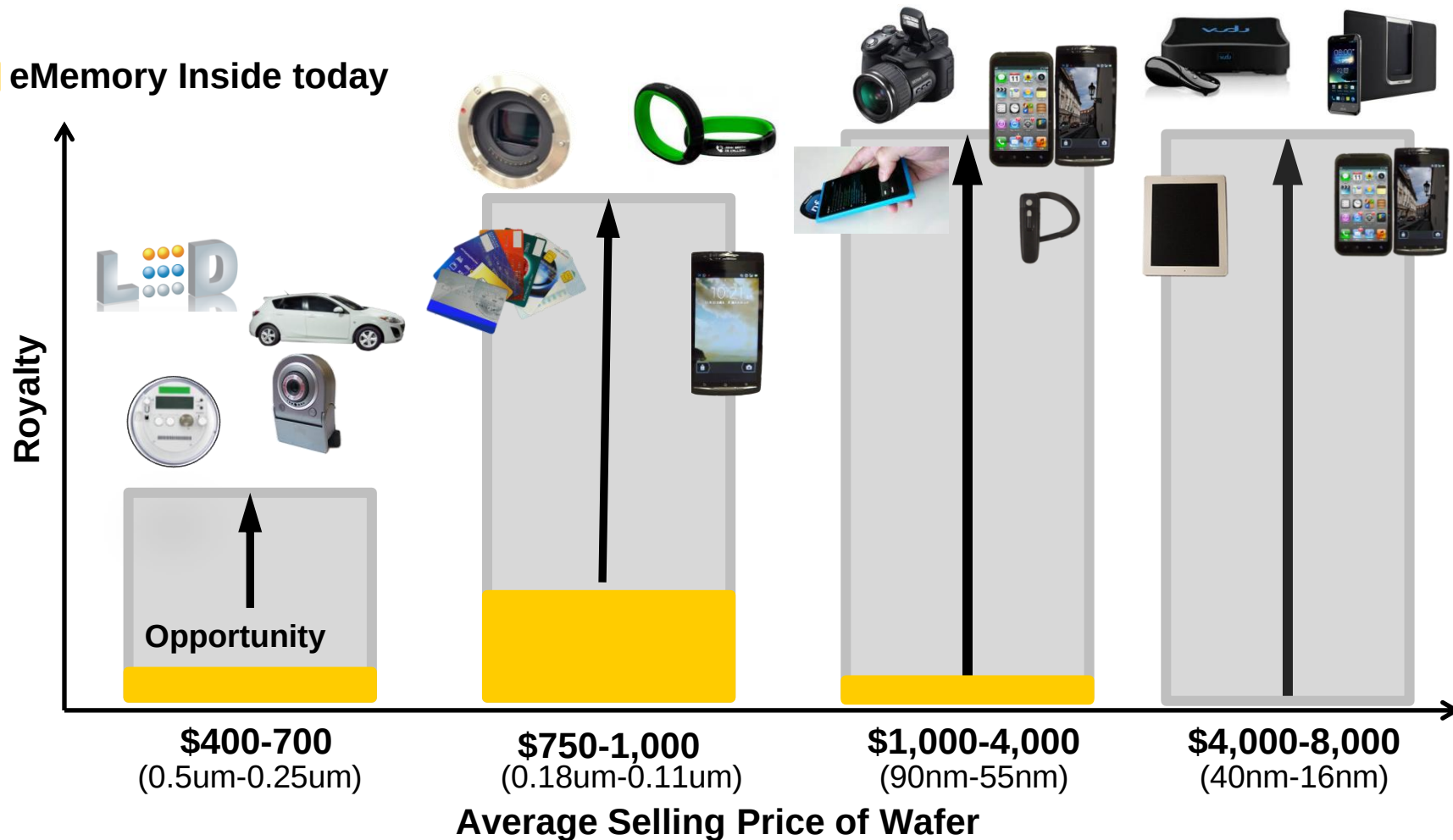
## Embedded Wisely, Embedded Widely

27

ememory

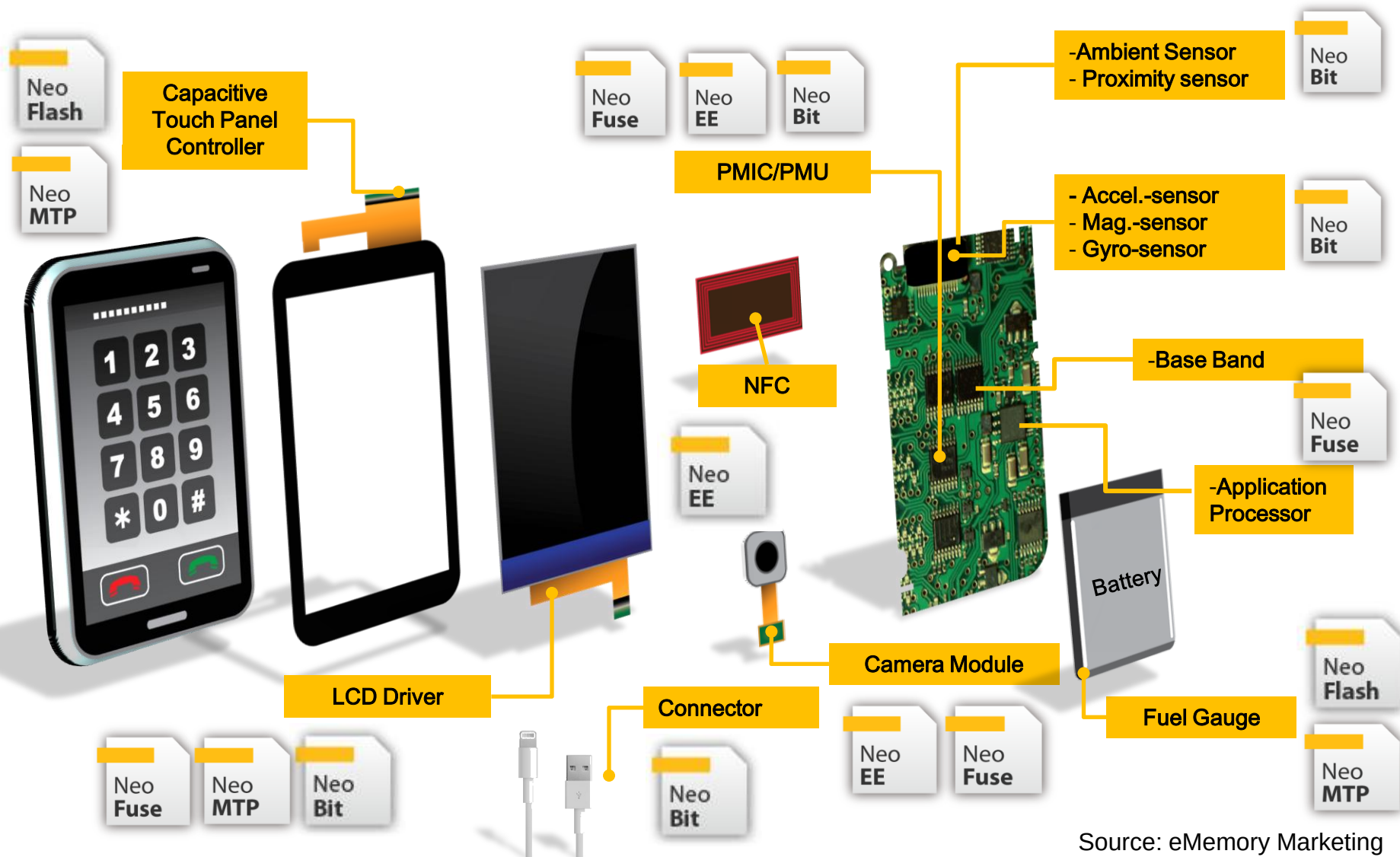
# 商機與潛力

 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

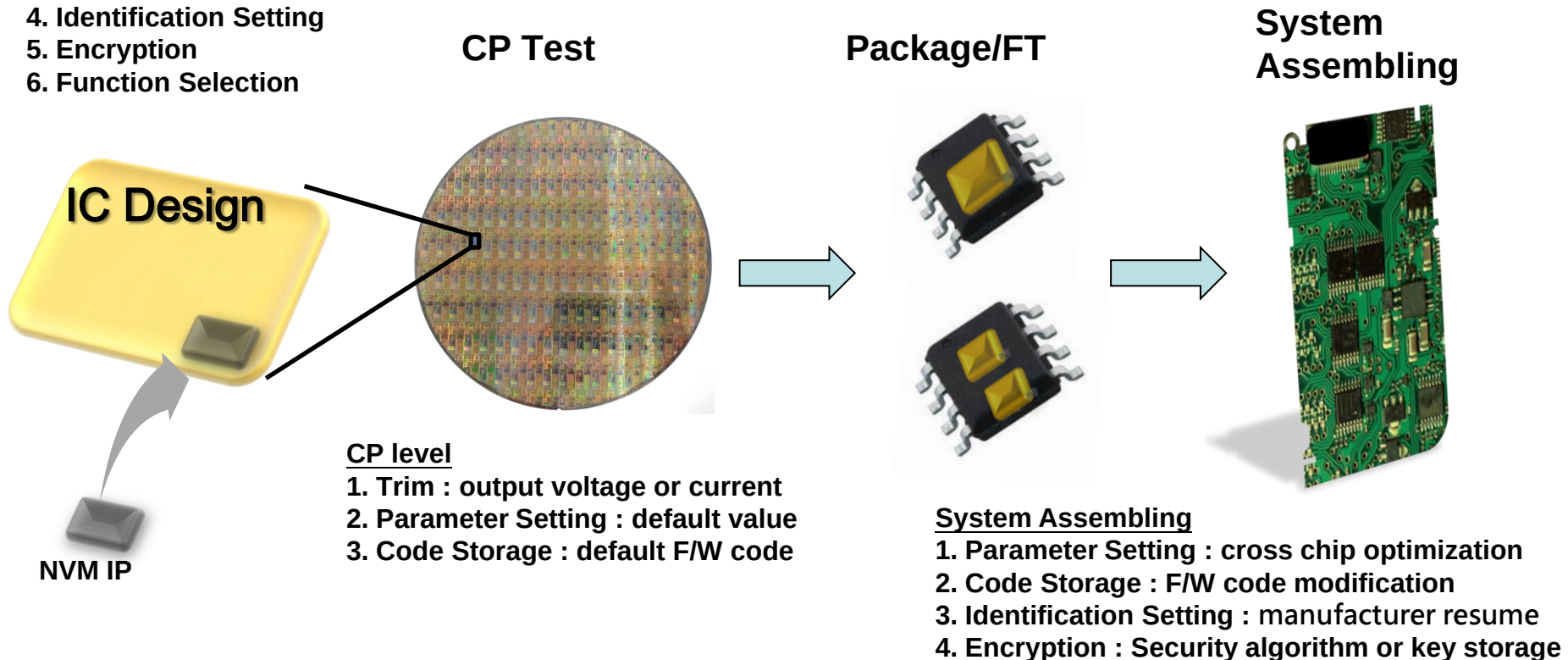
# Benefits from Using eMemory IPs

## 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



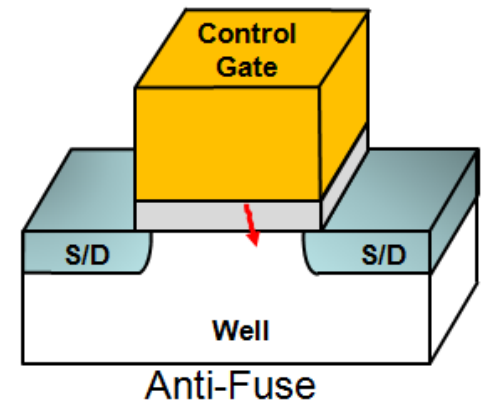
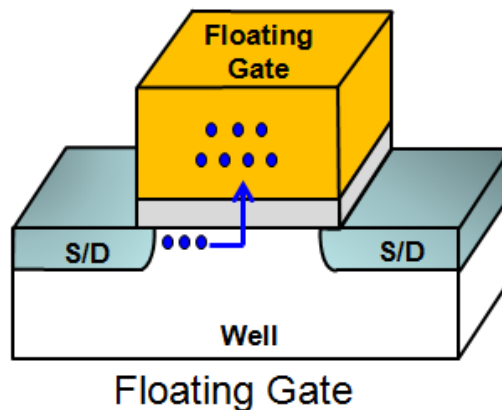
# 高機密性的安全設定

- 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



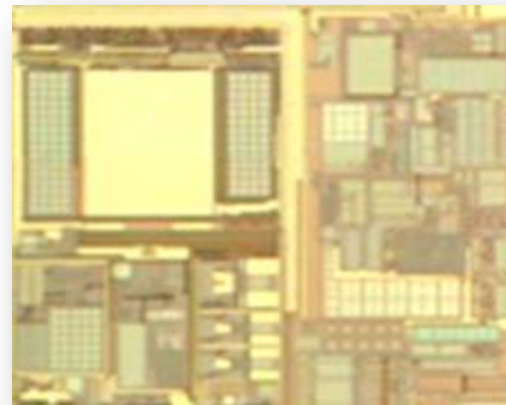
reverse  
copy

re-produce



without protection

Fake Product

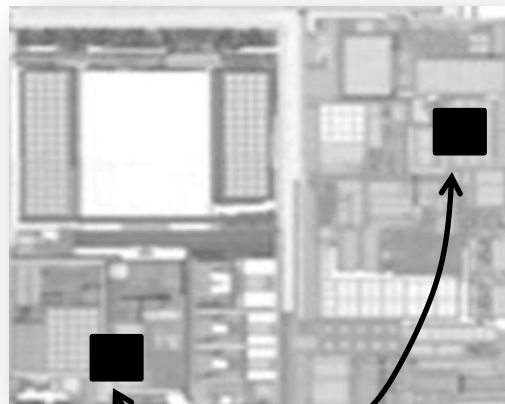


reverse  
copy

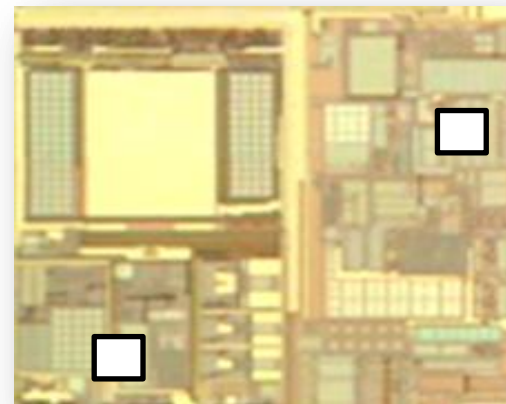
re-produce



with protection



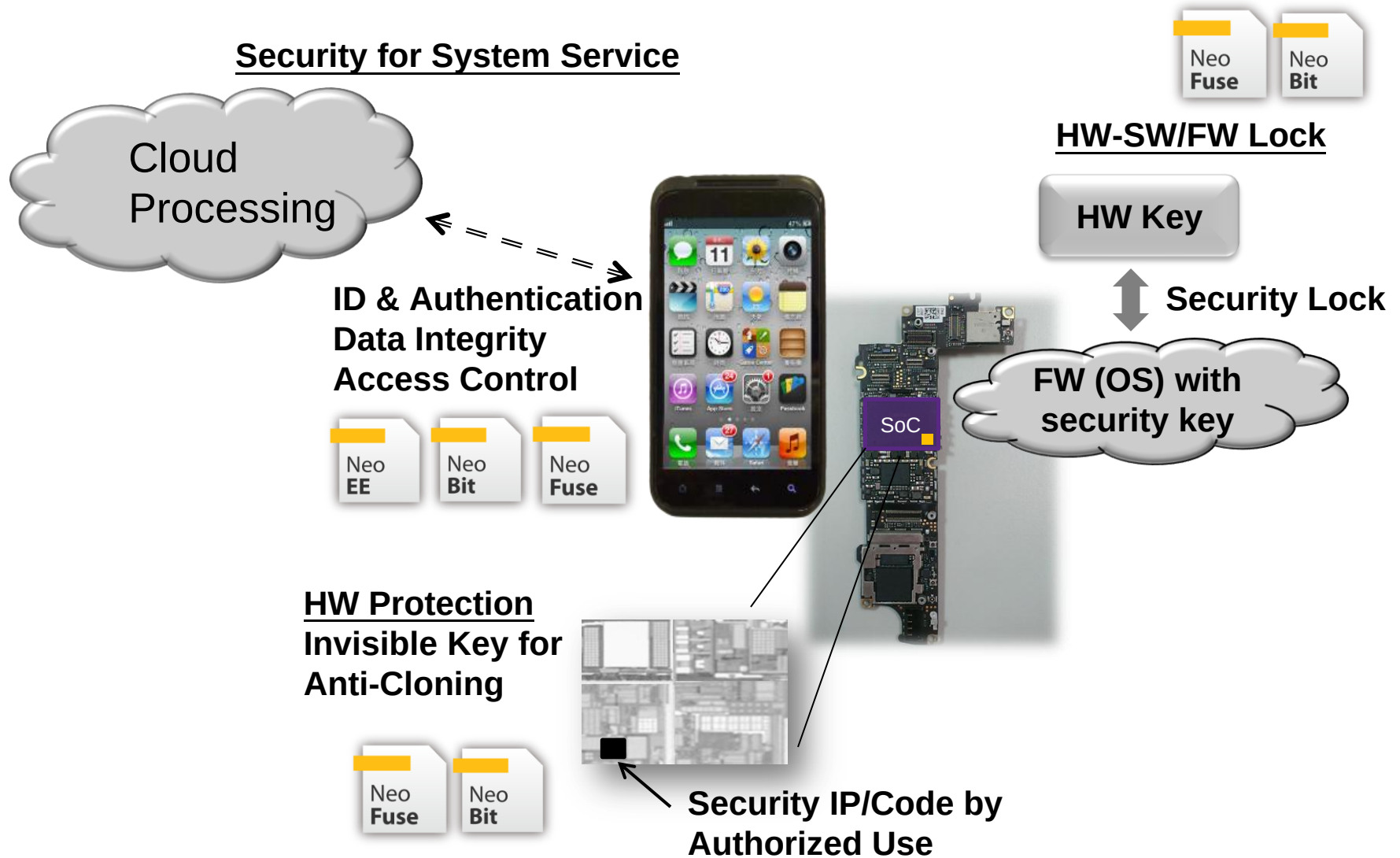
**Security IP/Code by  
Authorized Use**



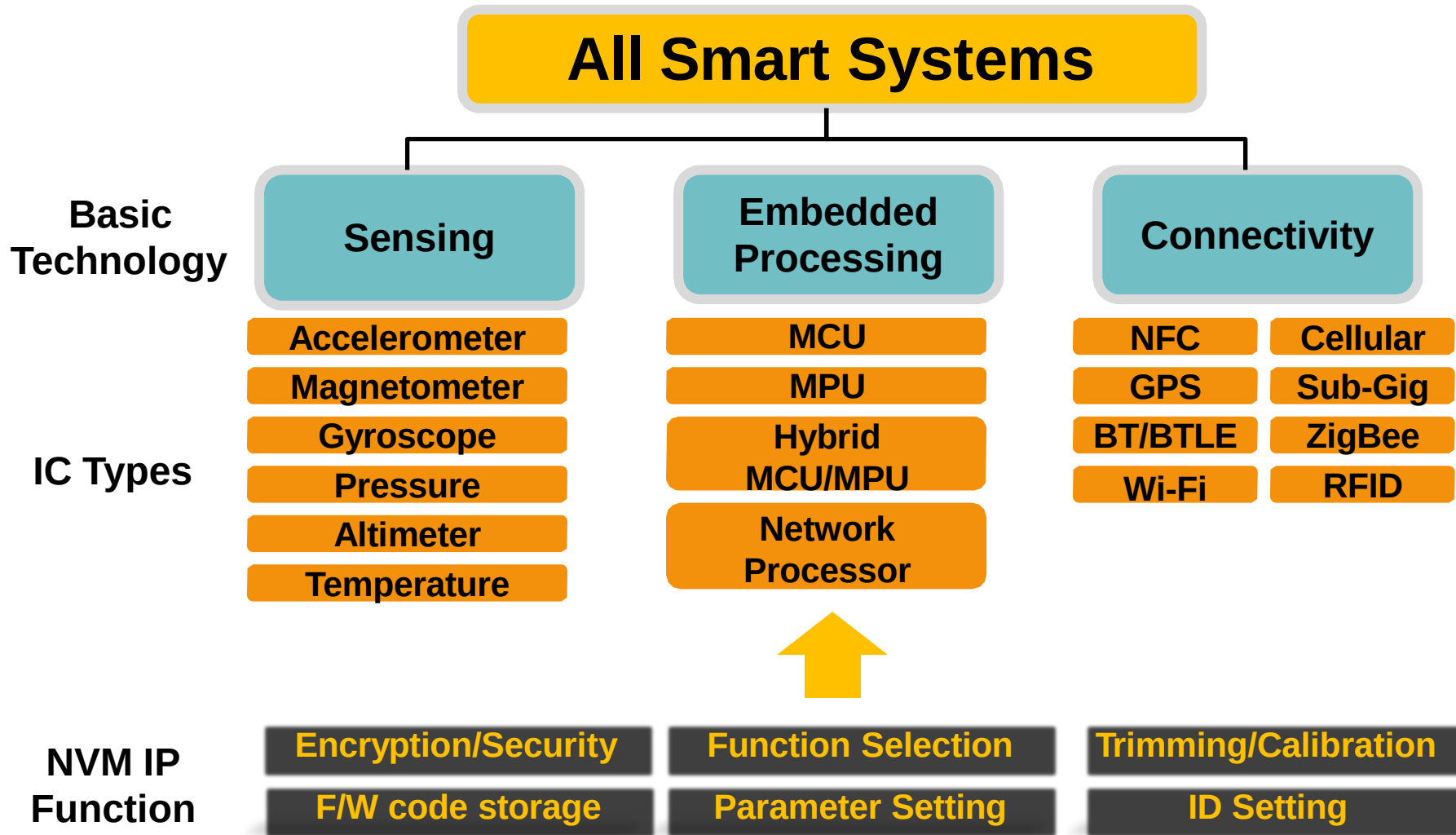
**Can NOT Work w/o  
Security IP/Code**



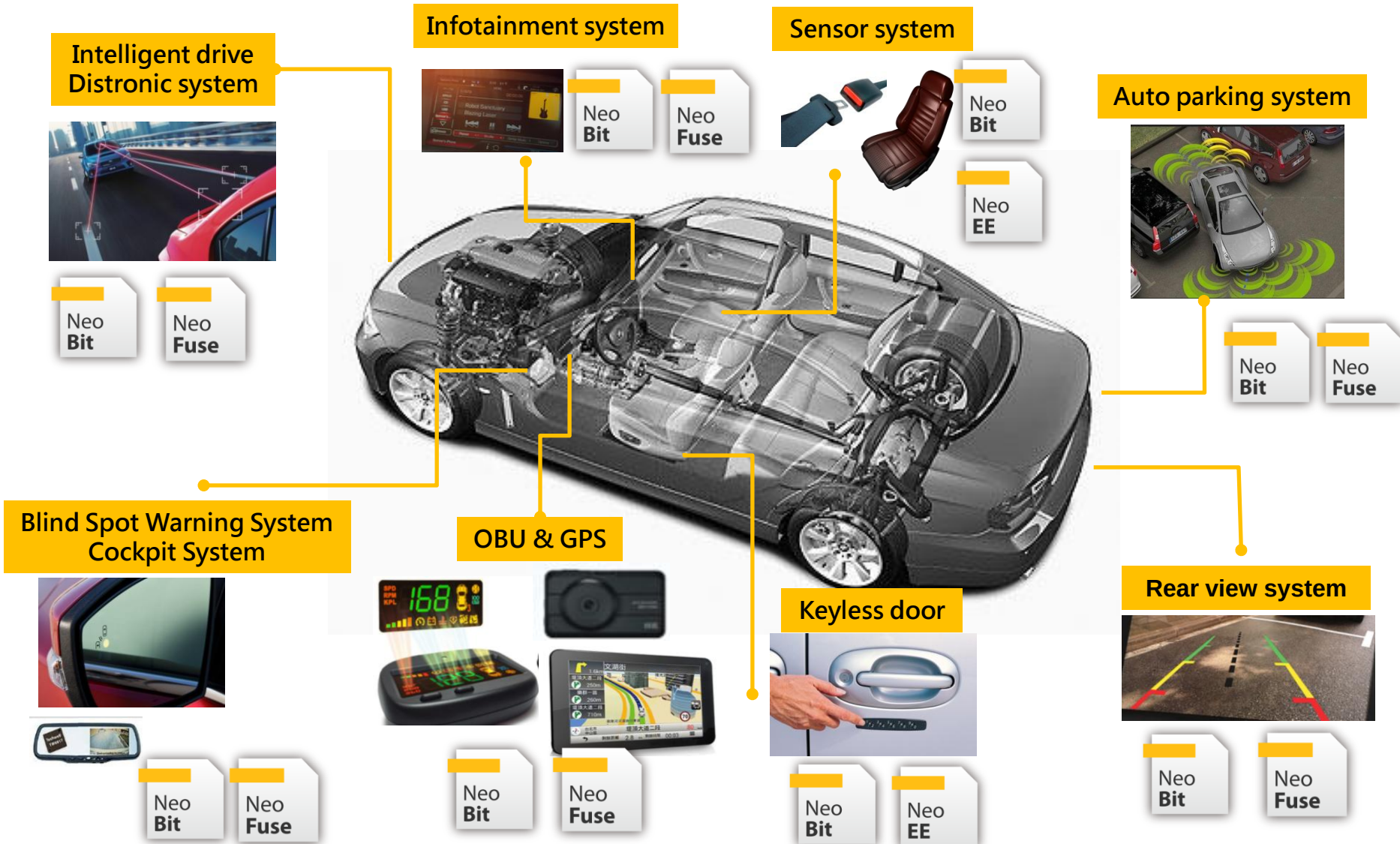
# 力旺矽智財引領高安全性應用



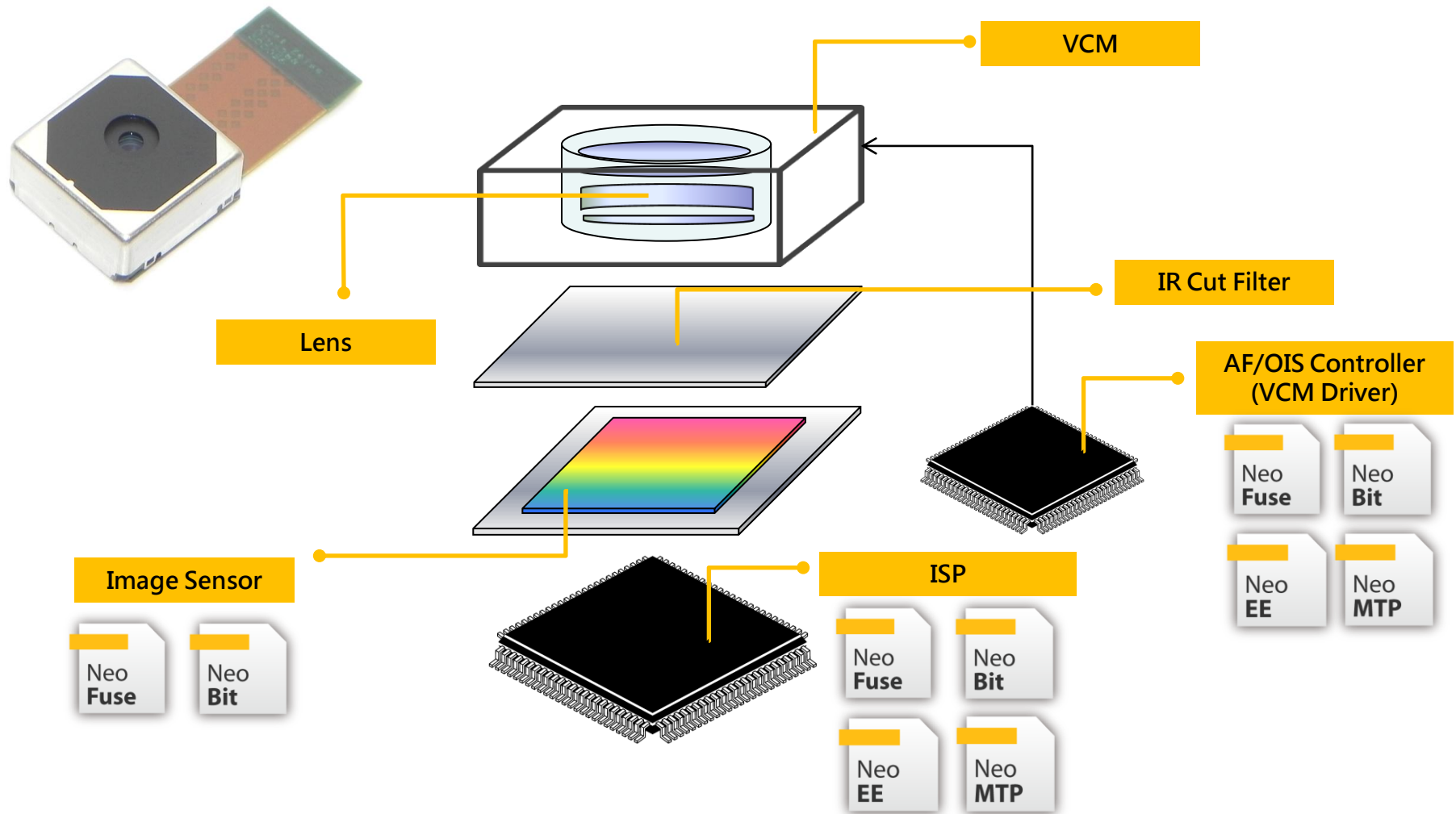
# 在IoT中之NVM IP 需求



# Autotronics with eMemory IPs



# Imager Module with eMemory IPs



# 先進液晶顯示驅動晶片

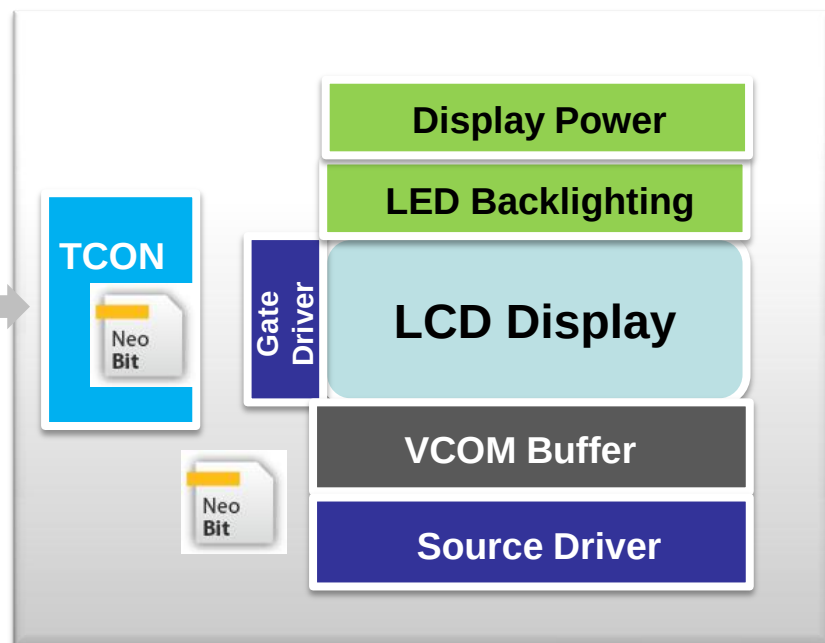
Process Technology : 0.11um HV/80nm HV/55nm HV



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



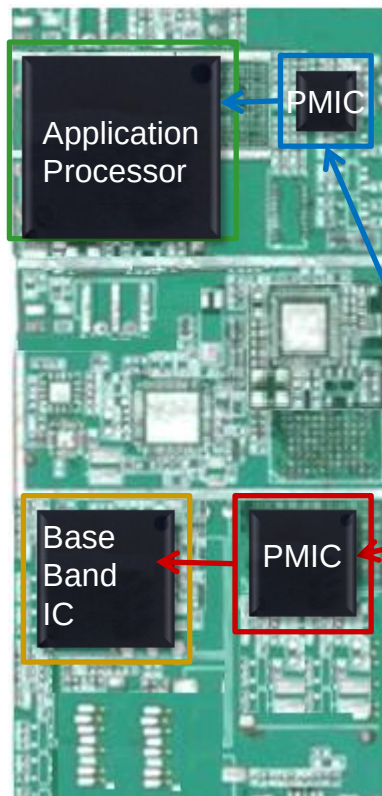
DDI



| Density | Endurance | NVM Type | Purpose      | NVM Usage                                                                                                                                           |
|---------|-----------|----------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| 2K8~4K8 | 1         | OTP      | Trimming     | <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

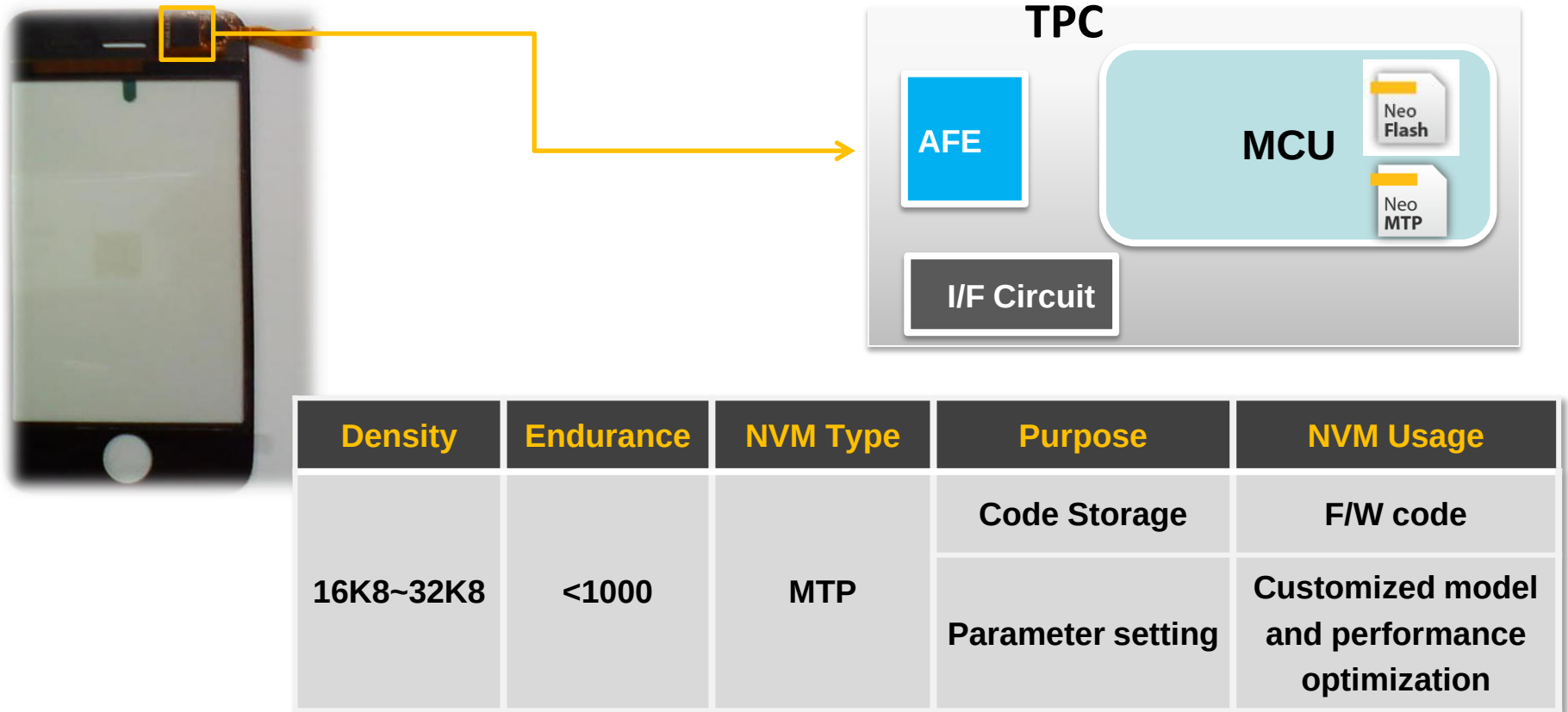


| Density | NVM Type | Purpose           | NVM Usage                                        |
|---------|----------|-------------------|--------------------------------------------------|
| 2Kb~4Kb | OTP      | Trimming          | DC/DC, Bandgap                                   |
|         |       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



# 觸控面板控制器晶片

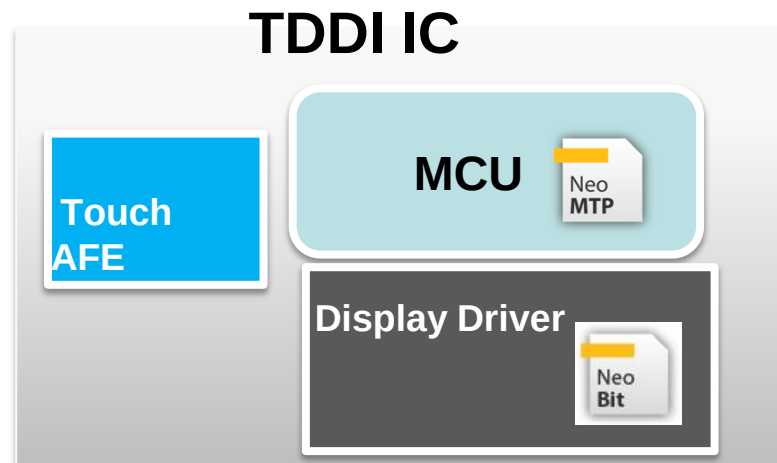
Process Technology : 0.16um HV/0.11um G





# 內嵌式觸控面板控制器晶片

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

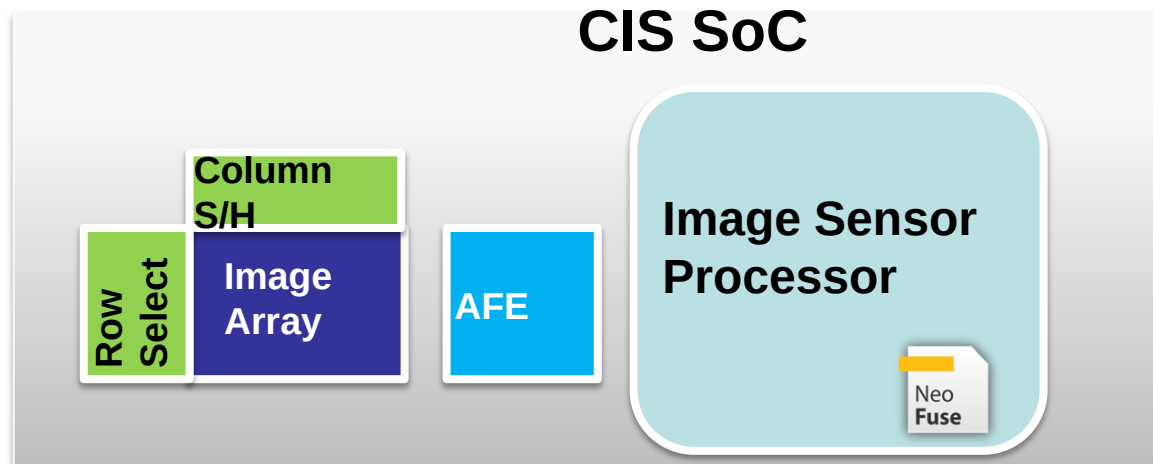
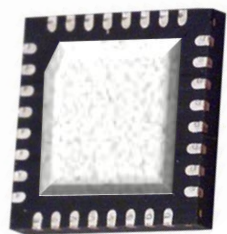


| Density   | Endurance | NVM Type | Purpose           | NVM Usage                |
|-----------|-----------|----------|-------------------|--------------------------|
| 2K8~4K8   | 1         | OTP      | Trimming          | Accuracy                 |
|           |           |          | Code Storage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



# CMOS 影像感測器

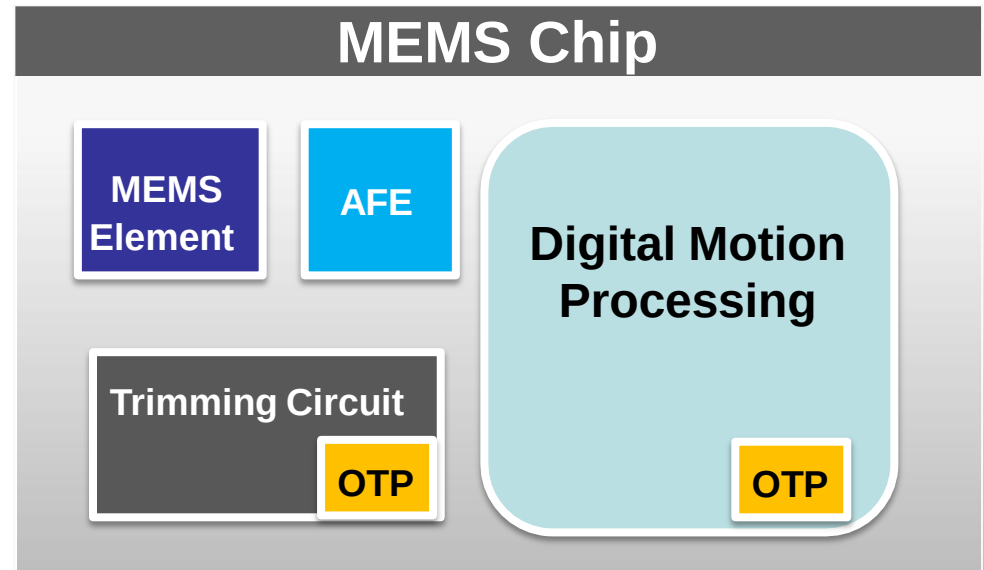
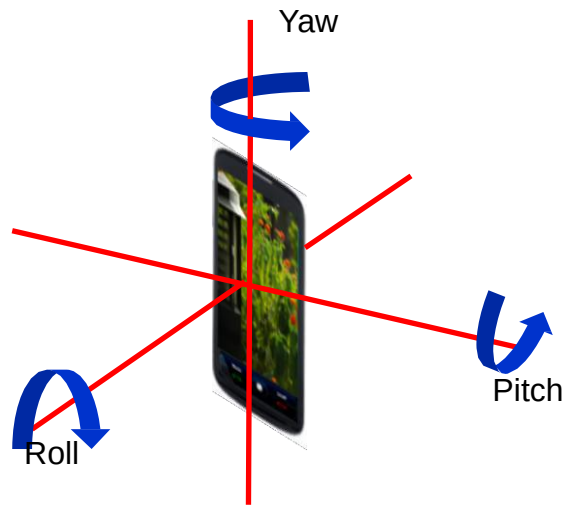
Process Technology : 0.11um CIS/90nm CIS/65nm CIS



| 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

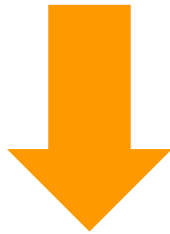


| Density | NVM Type | Purpose           | NVM Usage             |
|---------|----------|-------------------|-----------------------|
| 2Kb~4Kb | OTP      | Trimming          | Factory trimming      |
|         |          | Parameter Setting | Signal filtering      |
|         |          | Code Storage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

# 取代嵌入式快閃記憶體之競爭優勢

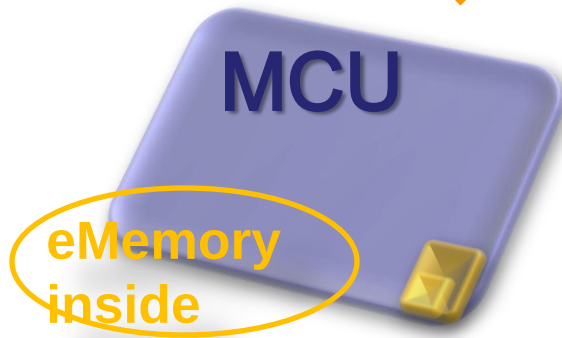


product design & manufacturing by  
embedded Flash  
Logic Process + 10 Masks



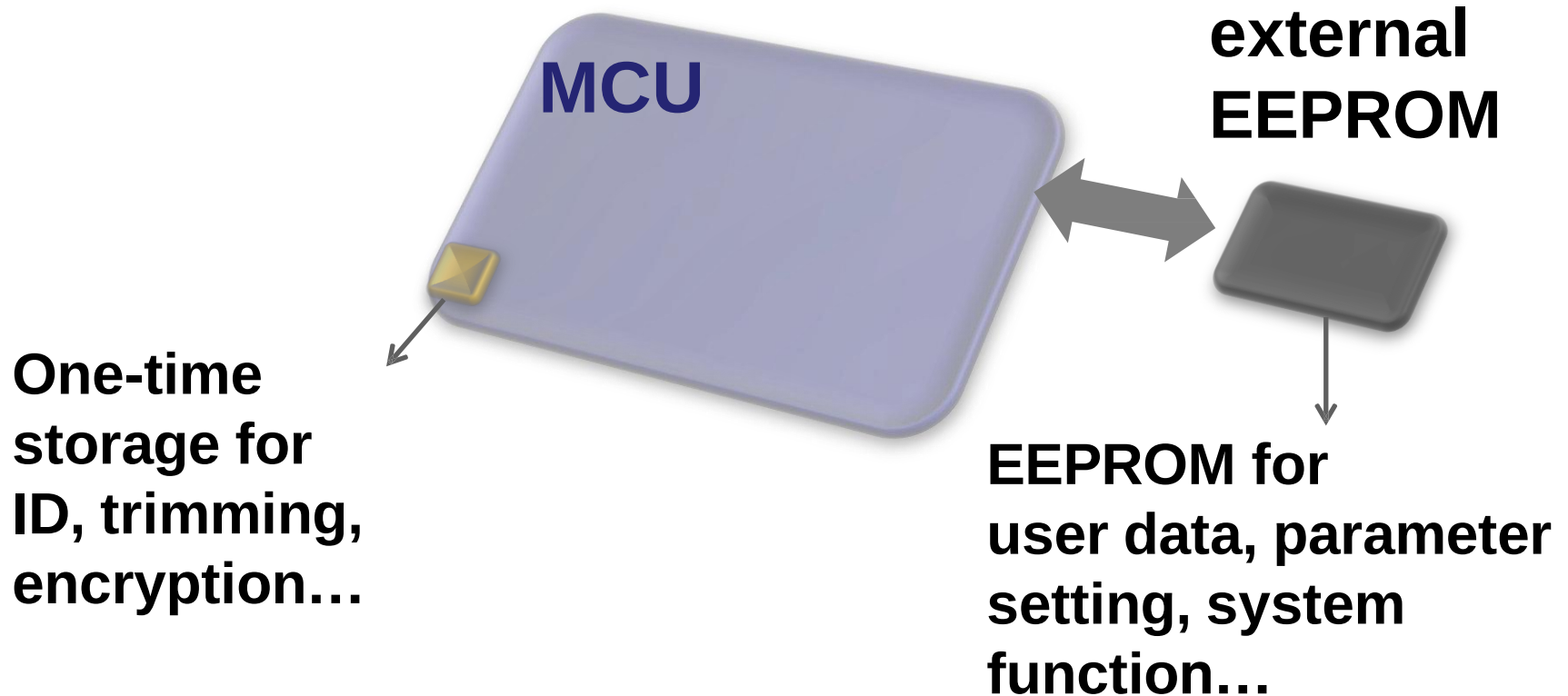
***30% more  
cost reduction***

***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

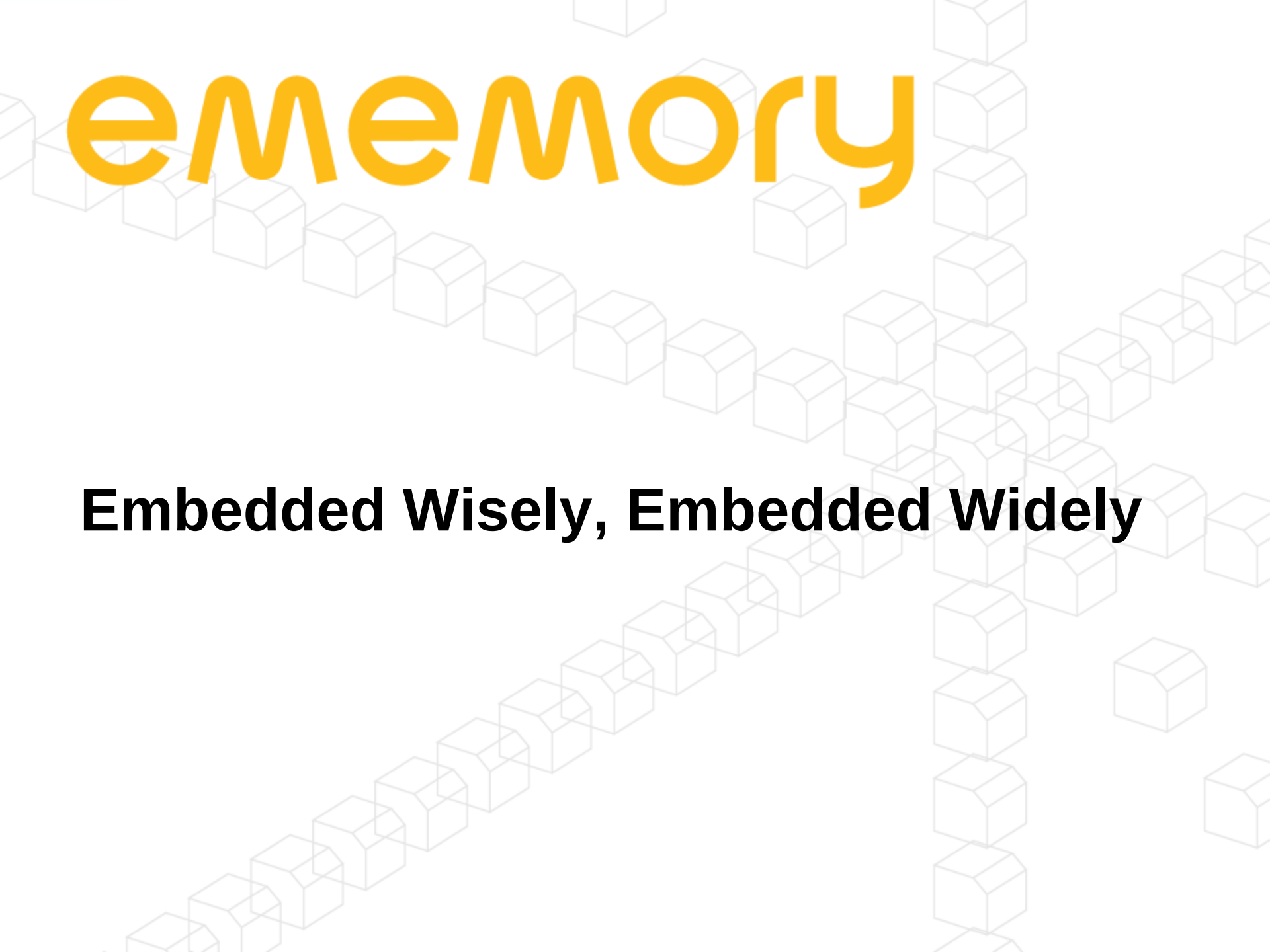
- Higher royalty per wafer is contributed from more advanced technology nodes.

## Great IoT era

- Embedded Logic NVM will be a must.



# Q & A



# ememory

**Embedded Wisely, Embedded Widely**