



# Investor Presentation

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**ememory**

A close-up photograph of a hand placing a coin on top of a stack of several other coins. To the left, another stack of coins has a small green plant with two leaves growing out of it. The background is a soft, out-of-focus green.

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A vertical image on the left side of the slide. It shows a close-up of a hand placing a coin on top of a stack of several other coins. To the left of this stack, another stack of coins is visible, with a small green plant growing out of it. The background is a soft, out-of-focus green.

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A close-up photograph of a hand placing a coin on a tall stack of coins. To the left, a small green plant with three leaves is growing out of a shorter stack of coins. The background is a warm, golden-yellow color. A white, brush-stroke-like diagonal line separates the image from the text area on the left.

# Review of Operations



# Q3 2020 Financial Results

The EPS of Q3 2020 was 2.26 NTD, ROE was 38.8%

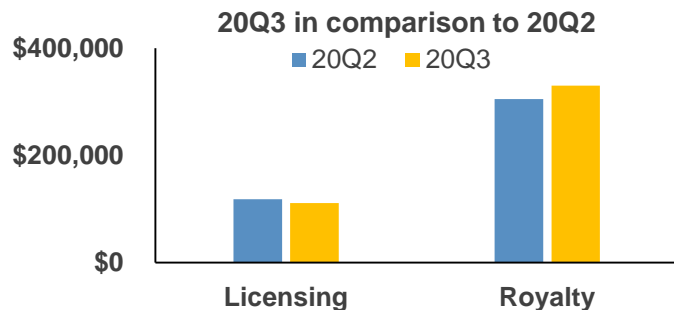
(thousands of NT dollars)

|                    | Q3 2020 | Q2 2020 | Change<br>(QoQ) | Q3 2019 | Change<br>(YoY) | Q1-Q3 2020 | Q1-Q3 2019 | Change<br>(YoY) |
|--------------------|---------|---------|-----------------|---------|-----------------|------------|------------|-----------------|
| Revenue            | 441,259 | 423,276 | 4.2%            | 336,587 | 31.1%           | 1,279,971  | 1,048,189  | 22.1%           |
| Gross Margin       | 100%    | 100%    | -               | 100%    | -               | 100%       | 100%       | -               |
| Operating Expenses | 243,913 | 227,364 | 7.3%            | 197,399 | 23.6%           | 692,740    | 586,376    | 18.1%           |
| Operating Income   | 197,346 | 195,912 | 0.7%            | 139,188 | 41.8%           | 587,231    | 461,813    | 27.2%           |
| Operating Margin   | 44.7%   | 46.3%   | -1.6 pts        | 41.4%   | 3.3 pts         | 45.9%      | 44.1%      | 1.8 pts         |
| Net Income         | 168,581 | 169,317 | -0.4%           | 120,170 | 40.3%           | 514,656    | 412,419    | 24.8%           |
| Net Margin         | 38.2%   | 40.0%   | -1.8 pts        | 35.7%   | 2.5 pts         | 40.2%      | 39.3%      | 0.9 ppt         |
| EPS (Unit: NTD)    | 2.26    | 2.28    | -0.9%           | 1.62    | 39.5%           | 6.92       | 5.56       | 24.5%           |
| ROE                | 38.8%   | 41.9%   | -3.1 pts        | 29.1%   | 9.7 pts         | 39.5%      | 33.3%      | 6.2 pts         |

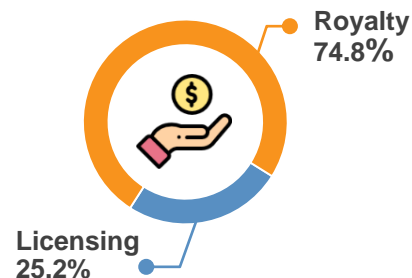
Note: Revenue of Q3 2020 in terms of US\$ is US\$14.96 mil, up 5.7% QoQ, and up 38.2% YoY.

# Revenue in Different Stream

Q3 revenue up 38.2% YoY in US dollar terms



Revenue Breakdown



Revenue

| NT\$ Thousands | Q3 2020 | Q2 2020 | QoQ   | Q3 2019 | YoY   | Q1-Q3 2020 | Q1-Q3 2019 | YoY   |
|----------------|---------|---------|-------|---------|-------|------------|------------|-------|
| Licensing      | 111,125 | 118,062 | -5.9% | 103,689 | 7.2%  | 335,633    | 314,319    | 6.8%  |
| Royalty        | 330,134 | 305,214 | 8.2%  | 232,898 | 41.8% | 944,338    | 733,870    | 28.7% |
| Total          | 441,259 | 423,276 | 4.2%  | 336,587 | 31.1% | 1,279,971  | 1,048,189  | 22.1% |

| US\$ Thousands | Q3 2020 | Q2 2020 | QoQ   | Q3 2019 | YoY   | Q1-Q3 2020 | Q1-Q3 2019 | YoY   |
|----------------|---------|---------|-------|---------|-------|------------|------------|-------|
| Licensing      | 3,765   | 3,953   | -4.8% | 3,335   | 12.9% | 11,260     | 10,146     | 11.0% |
| Royalty        | 11,195  | 10,196  | 9.8%  | 7,488   | 49.5% | 31,727     | 23,763     | 33.5% |
| Total          | 14,960  | 14,149  | 5.7%  | 10,823  | 38.2% | 42,987     | 33,909     | 26.8% |

# Revenue by Technology

The royalty of NeoFuse has a growth of 128.2% YoY in Q3

| Technology | Q3 2020         |              |              |                   |              |              |                 |              |              |
|------------|-----------------|--------------|--------------|-------------------|--------------|--------------|-----------------|--------------|--------------|
|            | Total Revenue   |              |              | Licensing Revenue |              |              | Royalty Revenue |              |              |
|            | % of Q3 Revenue | Change (QoQ) | Change (YoY) | % of Q3 Licensing | Change (QoQ) | Change (YoY) | % of Q3 Royalty | Change (QoQ) | Change (YoY) |
| NeoBit     | 53.7%           | 7.3%         | 10.4%        | 22.4%             | 22.5%        | -31.4%       | 64.2%           | 5.8%         | 18.9%        |
| NeoFuse    | 39.8%           | -2.4%        | 84.9%        | 61.7%             | -18.2%       | 42.7%        | 32.4%           | 11.4%        | 128.2%       |
| PUF-Based  | 1.4%            | 120.6%       | 100.0%       | 5.6%              | 120.6%       | 100.0%       | 0.0%            | 0.0%         | 0.0%         |
| MTP        | 5.1%            | 13.6%        | -16.1%       | 10.3%             | 3.0%         | -40.9%       | 3.4%            | 26.9%        | 45.5%        |

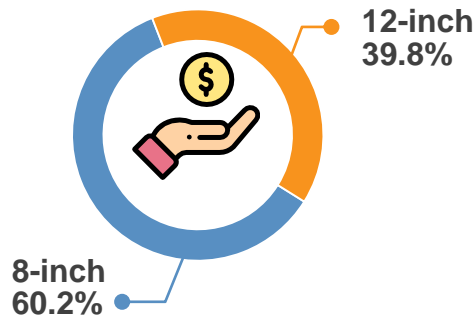
| Technology | Q1-Q3 2020         |              |                      |              |                                    |
|------------|--------------------|--------------|----------------------|--------------|------------------------------------|
|            | Total Revenue      |              | Licensing Revenue    |              | Royalty Revenue                    |
|            | % of Q1-Q3 Revenue | Change (YoY) | % of Q1-Q3 Licensing | Change (YoY) | % of Q1-Q3 Royalty<br>Change (YoY) |
| NeoBit     | 53.2%              | 3.6%         | 20.7%                | -17.5%       | 64.7%<br>6.7%                      |
| NeoFuse    | 41.3%              | 71.8%        | 67.6%                | 27.1%        | 31.9%<br>133.7%                    |
| PUF-Based  | 0.7%               | 1,429.3%     | 2.9%                 | 1,429.3%     | 0.0%<br>0.0%                       |
| MTP        | 4.8%               | -25.9%       | 8.8%                 | -41.9%       | 3.4%<br>-0.3%                      |



# Royalty Revenue by Wafer Size

12-inch wafer increased 70.5% YoY

## Q3 Royalty Breakdown



- ✓ 12-inch wafers contributed 39.8% of royalty, increased 19.8% sequentially and 70.5% YoY.
- ✓ 8-inch wafers contributed 60.2% of royalty, increased 1.7% sequentially and 27.6% YoY.

## Royalty

| Wafer Size | Q3 2020 |              |              | Q1-Q3 2020 |              |
|------------|---------|--------------|--------------|------------|--------------|
|            | % of Q3 | Change (QoQ) | Change (YoY) | % of Q1-Q3 | Change (YoY) |
| 8-Inch     | 60.2%   | 1.7%         | 27.6%        | 62.7%      | 16.9%        |
| 12-Inch    | 39.8%   | 19.8%        | 70.5%        | 37.3%      | 55.0%        |

# Future Outlook

# eMemory Embedded Everywhere

eMemory's IP seeks to penetrate across all the applications

Core Tech



## ✓ **Product Applications:**

eMemory's IP are already applied into different applications, which includes PMIC, LCD driver, Sensors, RFID, OLED Driver, Connectivity IC, DTV, STB, SSD Controller, Bluetooth, TDDI, MCU, Fingerprint Sensor, Smart Meters, Surveillance, ISP, CIS, DRAM, embedded Flash and FPGA.

## ✓ **Future Target:**

AP, GPU, CPU, Flash, IoT, AI, autonomous driving



## ✓ **The Future in Security Chip IP:**

The rapid growth in AIoT and 5G drive the demand for hardware security. OTP and PUF are indispensable for root of trust in hardware security.

## ✓ **PUF-based Security Solutions:**

To satisfy the market needs, eMemory developed a new series of PUF-based security solution, including PUFrt, PUFiot, PUFse and PUFflash.

Security

# Our Perspectives

eMemory continue to create value for the industry and our shareholders

## Licensing & Royalty



### ✓ Licensing:

- NeoFuse and NeoPUF will continue to grow due to increasing demand for design license activity and technology platforms that are continuously built among foundry partners.

### ✓ Royalty:

- 8" royalty will grow due to PMIC content increase in 5G smartphone and demand pick-up for automotive and IoT applications.
- 12" royalty will have a strong growth as customers are ramping up productions for ISP, OLED, Networking-related such as WiFi 6, Multimedia-related, DRAM, SSD controller and others.

## New Application & Technology Development



### ✓ For New Business Development:

- NeoFuse in advanced process is adopted for secure key storage. We expect this will be a trend for security requirement.
- Business activities of PUF-based security solutions are in progress in applications of IoT, IIoT, AI, Blockchain, DPU, UFS, and automotives.
- Partnership with ARM and RISC-V will extend our PUF-based security platform.

### ✓ For New IP Technology Development:

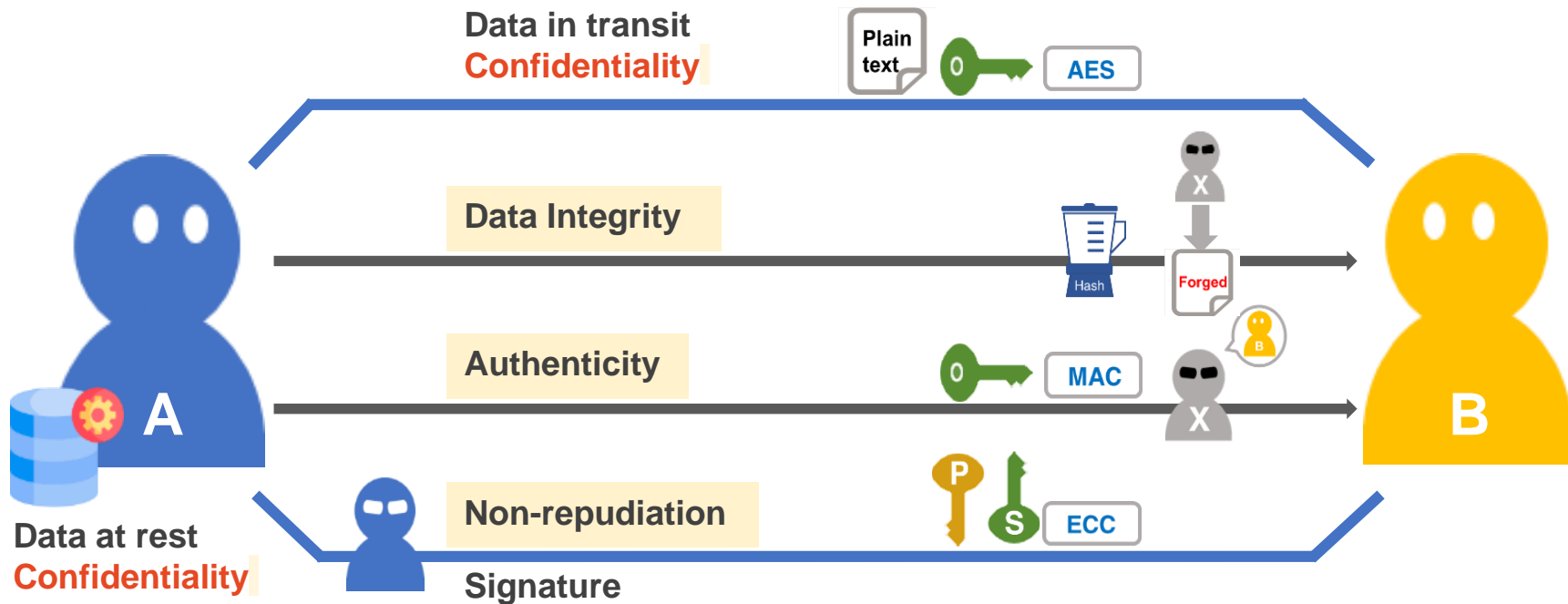
- Developing 6nm and 5nm plus (N5P) technology with leading foundry partners; demonstrated 6nm silicon results successfully.
- Announced crypto processor, PUFiot
- Develop PUF-based solution to be implemented in HSM.

A close-up photograph of a hand dropping a coin into a stack of coins. A small green plant with three leaves is growing out of the stack. The background is a warm, golden-yellow color. A white, brush-stroke-like line runs diagonally across the image, separating the top part from the bottom part.

# How PUF Works for AI Security

# Typical AI Security Concerns We Face

We utilize cryptographic operations and keys to ensure security

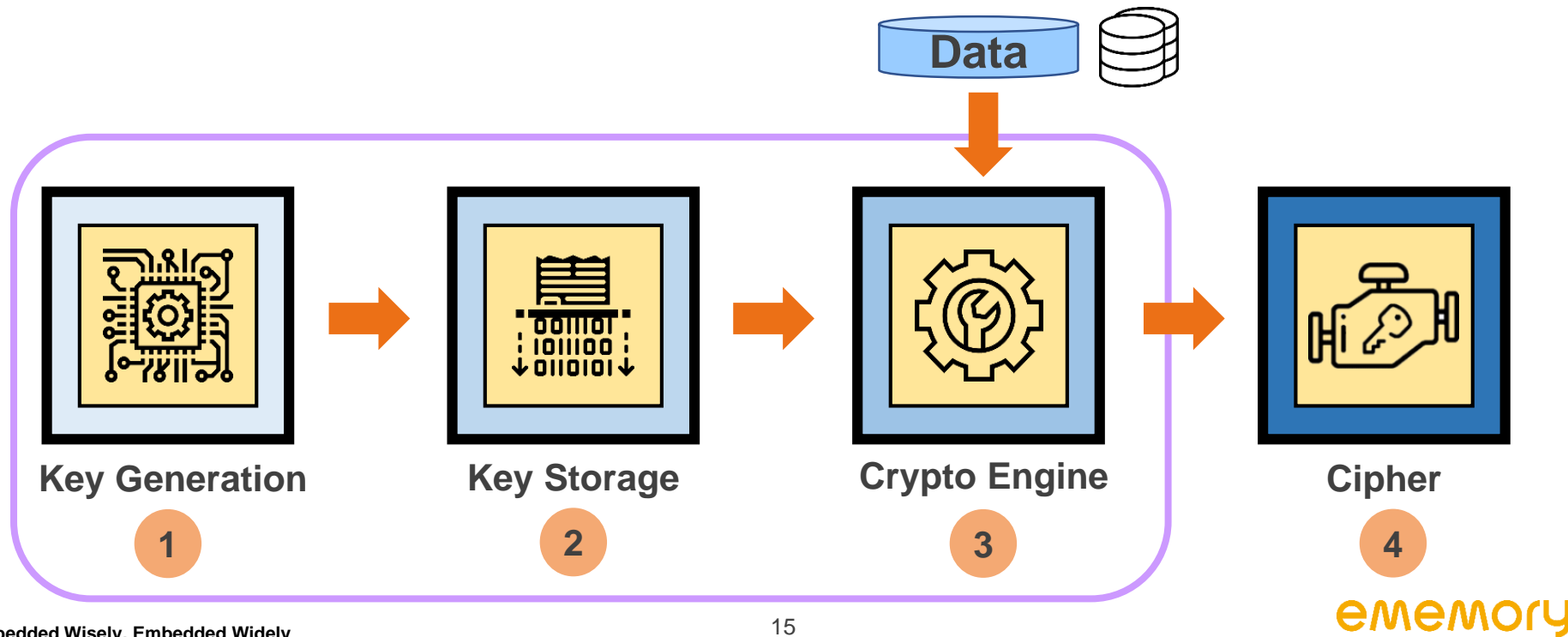




# The Foundation of AI Security: RoT

We refer to the anchor of secure device as Root-of-Trust (RoT)

- Protecting keys right from generation is therefore pivotal



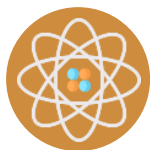
# Towards a RoT for AI Security

Generating key, storing key and using key in cryptographic operation

- It all comes down to 3 essential problems to solve.



**How can we  
generate secret key?**



**Utilize process variation  
→ Chip Fingerprint**



**How can we  
store keys securely?**



**Static & Dynamic Entropy  
from Root-of-Trust**



**How can we secure key  
usage in operations?**

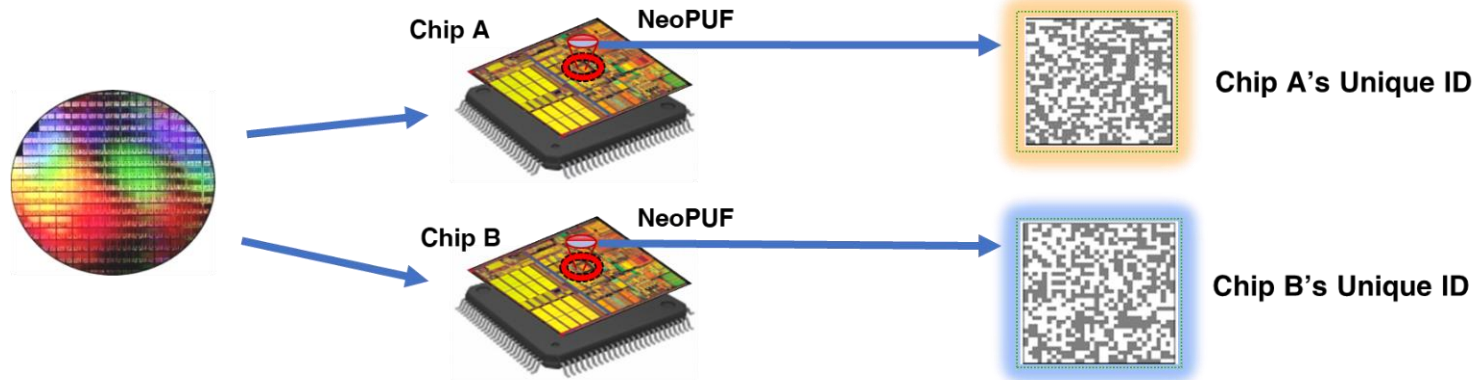


**Equip Root-of-Trust with  
complete set of algorithms**

# NeoPUF: The Inborn Chip Fingerprint

A truly random sequences for applications with high security requirements can be generated

- NeoPUF utilizes Quantum Tunneling mechanism to generate a one-and-only “biometric identifier” of each and every chip



**Unique**



**Random**



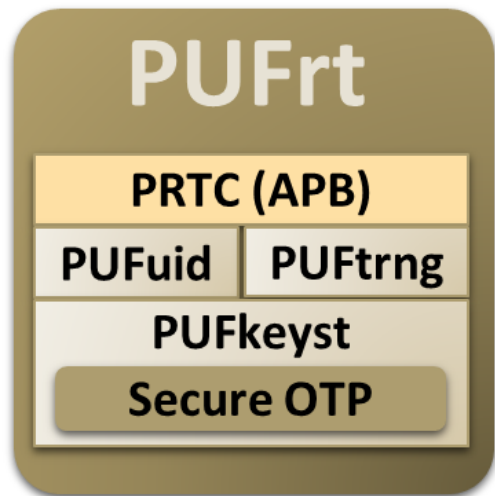
**Reliable**



**Untraceable**

# PUFrt: A PUF-based Hardware RoT

PUFrt integrates altogether key generation, key storage, and entropies to protect operations



## A Highly Integrated PUF-based HRoT with complete Anti-tampering Design



On-chip UIDs  
for Authentication



PUF-based TRNG  
for crypto usages

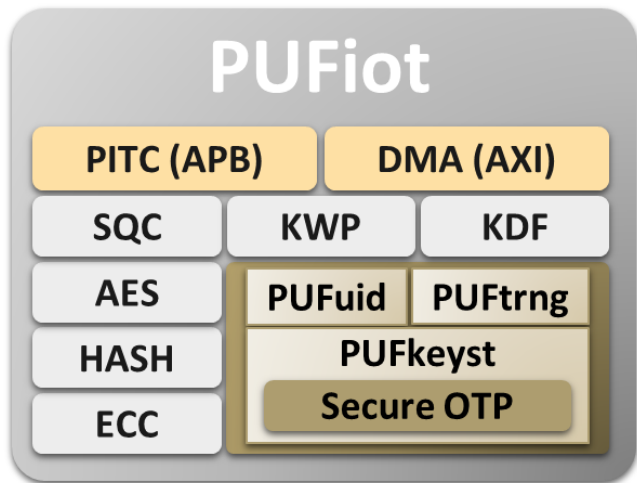


Secure Key storage  
for asset protection

# PUFiot: A PUF-based Security Crypto Processor

PUFiot incorporates crypto-algorithms, enabling all security functions

**A HW Crypto processor with entropy protection on data, keys and crypto operations**



- Key Generation
- Key Wrapping



- Symm. & Asymm. Authentication






- Integrity Check
- Encryption



- Secure Boot
- TLS
- Key mgmt.

# PUF-based Solutions Secure All AI Operations

PUFrt and PUFiot enhance security functions during AI operations

| Security<br>AI Operation                | Threat Model  | Countermeasure   | Security Function   | Security Solution   |
|---|---|--|---|---|
| <b>Device Boot &amp; Authentication</b> | <ul style="list-style-type: none"> <li>• Malicious FW loaded</li> <li>• Unauthorized device</li> </ul>                                    | <ul style="list-style-type: none"> <li>• Secure Booting</li> <li>• Authentication and Provisioning</li> </ul>  | <ul style="list-style-type: none"> <li>• Secure key storage</li> <li>• Unique Identifier (UID)</li> </ul>                               | <b>PUFrt</b><br><br><b>PUF-based Root of Trust</b>     |
| <b>Model Training &amp; Deployment</b>  | <ul style="list-style-type: none"> <li>• Training Data stolen</li> <li>• Model stolen from edge</li> <li>• Data/Model Modified</li> </ul> | <ul style="list-style-type: none"> <li>• Protect data-in-transit</li> <li>• Protect deployed model</li> <li>• Integrity Check</li> </ul>               | <ul style="list-style-type: none"> <li>• Data/Model Encryption</li> <li>• Hashing and Signature</li> </ul>                              | <b>PUFiot</b><br><br><b>PUF-based Crypto Processor</b> |
| <b>Input &amp; Inference</b>            | <ul style="list-style-type: none"> <li>• Unauthorized user</li> <li>• User data privacy leak</li> <li>• Input/Result tampered</li> </ul>  | <ul style="list-style-type: none"> <li>• Authentication and Provisioning</li> <li>• Protect data-at-rest</li> <li>• Ensure integrity/source</li> </ul> | <ul style="list-style-type: none"> <li>• Unique Identifier (UID)</li> <li>• Data Encryption</li> <li>• Hashing and Signature</li> </ul> | <b>PUFiot</b><br><br><b>PUF-based Crypto Processor</b> |



# Summary: PUF-based Solutions for AI Security

The underlying benefit of using a PUF in cryptography is its “uniqueness” and “unpredictability”



**NeoPUF-based Hardware Root of Trust**, containing NeoPUF and OTP, provides

- Unique Identity
- Secure Key Storage
- True Random Number Generator
- Anti-Tampering Solutions



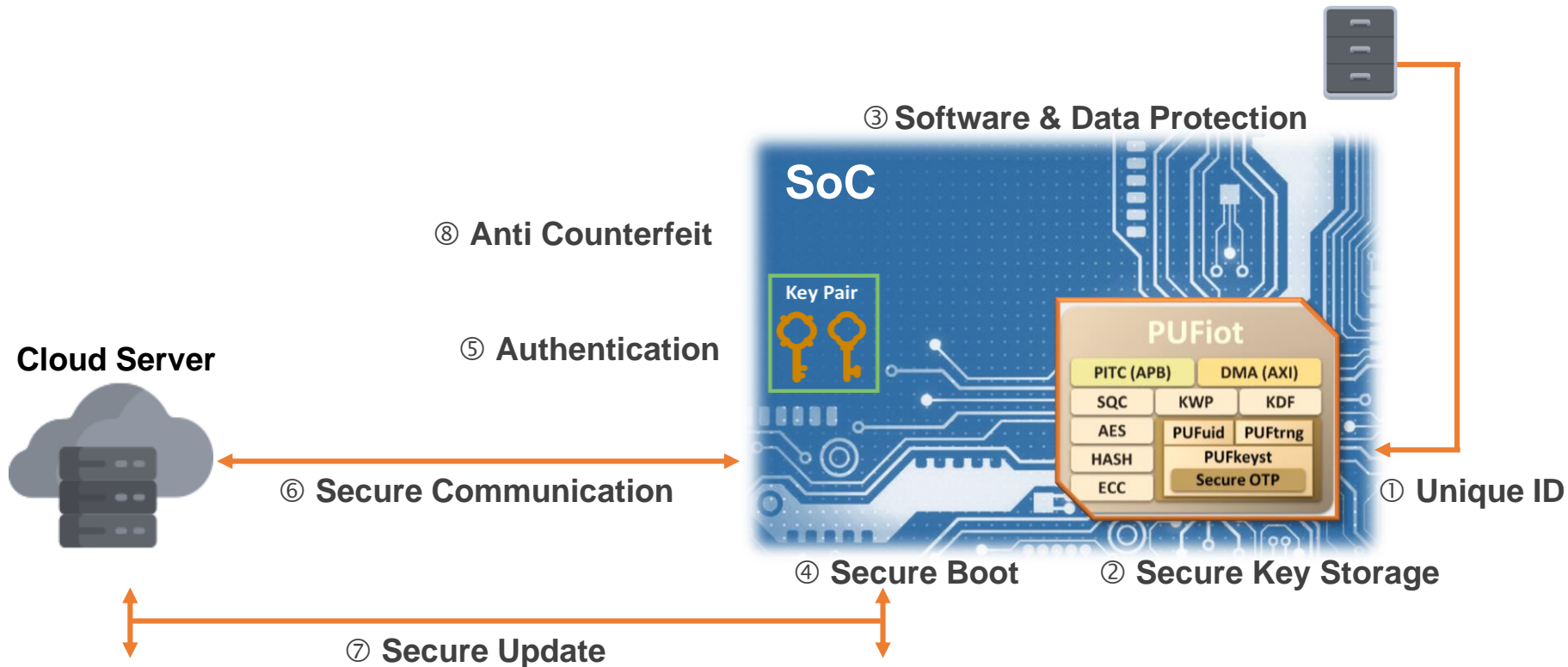
**Plus**

- High Manufacturability
- Ultra Low Cost



**A High Value Proposition for Secure AI Applications**

# PUF-based Solutions Safeguard Products Throughout Entire Lifecycle



# Q&A



A close-up photograph of a hand dropping a coin into a stack of coins. A small green plant with three leaves is growing out of the stack. The background is a warm, golden-yellow color. The image is partially obscured by a white, brush-stroke-like graphic element that runs diagonally across the frame.

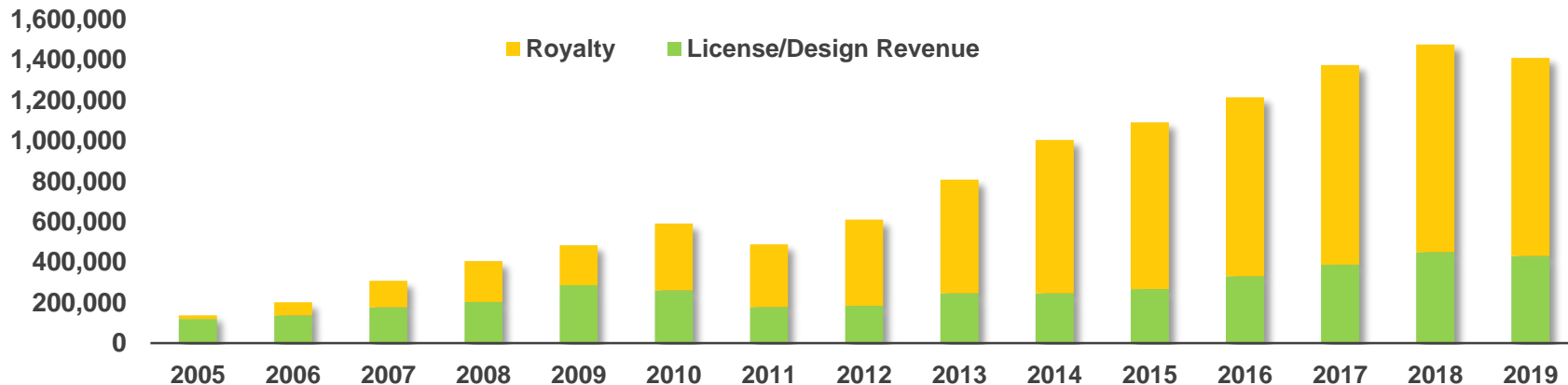
# Appendix

# Company Overview

eMemory is the global leader of embedded non-volatile memory IP

## Revenue Trend

(Unit: NT\$ 1,000)



## Founded In 2000

Based in Hsinchu, Taiwan.  
IPO in 2011. Over 31M wafers shipped.

## 800+ Patents Issued

263 pending patents. 286 employees with 67% R&D personnel.

## Best IP Partner With TSMC

TSMC Best IP Partner Award since 2010.

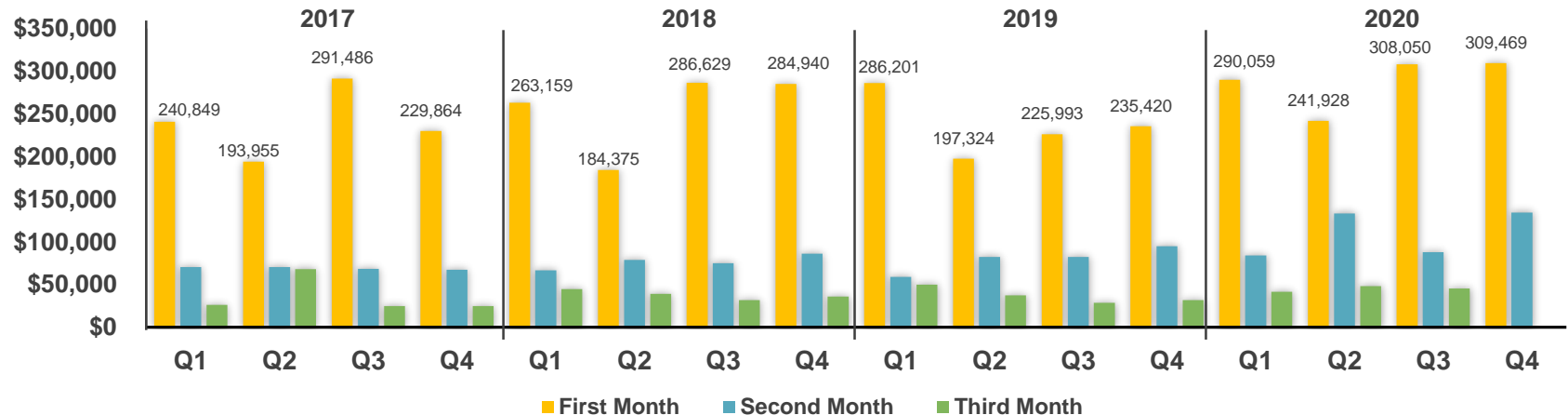
# Quarterly Revenue Pattern

## eMemory's quarterly revenue pattern

- ✓ 1<sup>st</sup> month: Receive **License Fees** of the month and **Royalty** from most foundries on previous quarter's wafer shipments.
- ✓ 2<sup>nd</sup> month: Receive **License Fees** of the month and **Royalty** from other foundries.
- ✓ 3<sup>rd</sup> month: **License Fees** Only.

Note: One foundry pays royalty semiannually, reported in Jan and July revenue.

(Unit: NT\$ 1,000)





# Worldwide Customers

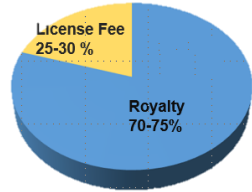
Our IP solutions are adopted by leading foundries, IDMs and fabless worldwide

| Country       | Foundry | IDM | Fabless |
|---------------|---------|-----|---------|
| Taiwan        | 4       | 1   | 302     |
| China         | 8       | 0   | 812     |
| Korea         | 4       | 0   | 87      |
| Japan         | 4       | 7   | 64      |
| North America | 1       | 1   | 306     |
| Europe        | 2       | 1   | 177     |
| Others        | 1       | 0   | 76      |

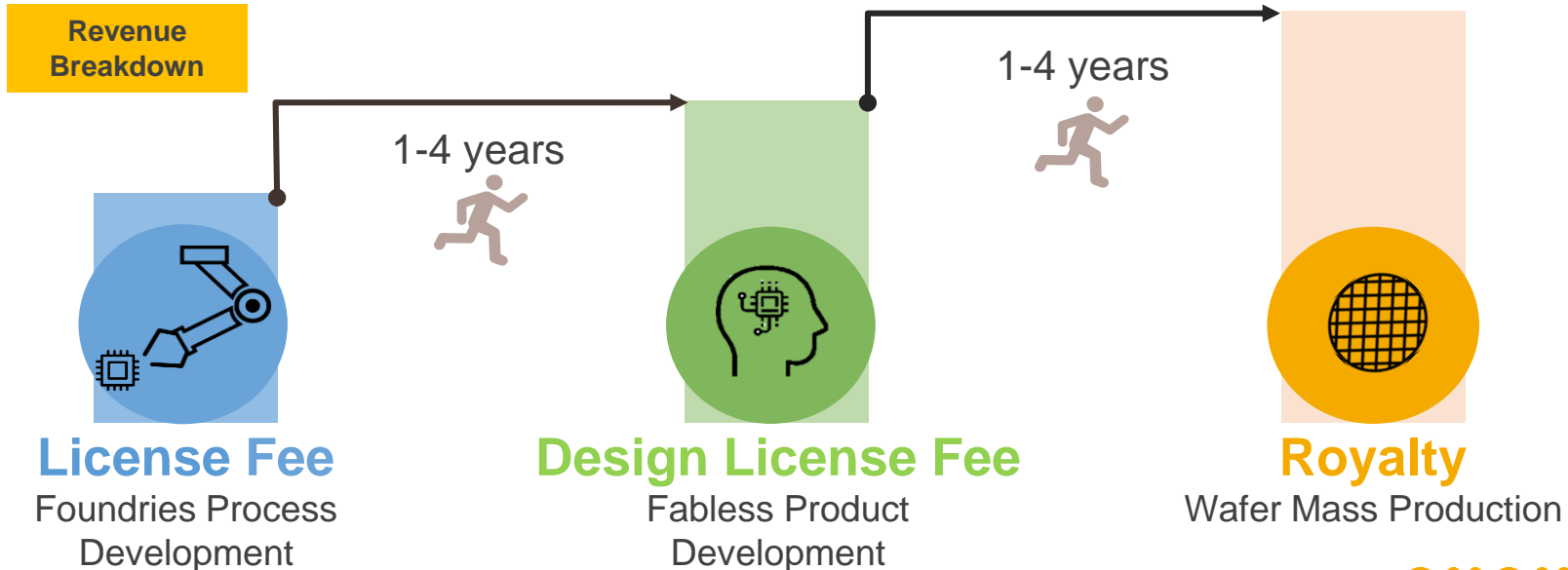


# Business Model

Recurring royalty is the backbone of our business



- ✓ 70-75% revenue are from royalty based on wafer production
- ✓ More adoption = more volume shipment
- ✓ More advanced node wafers = higher ASP per wafer



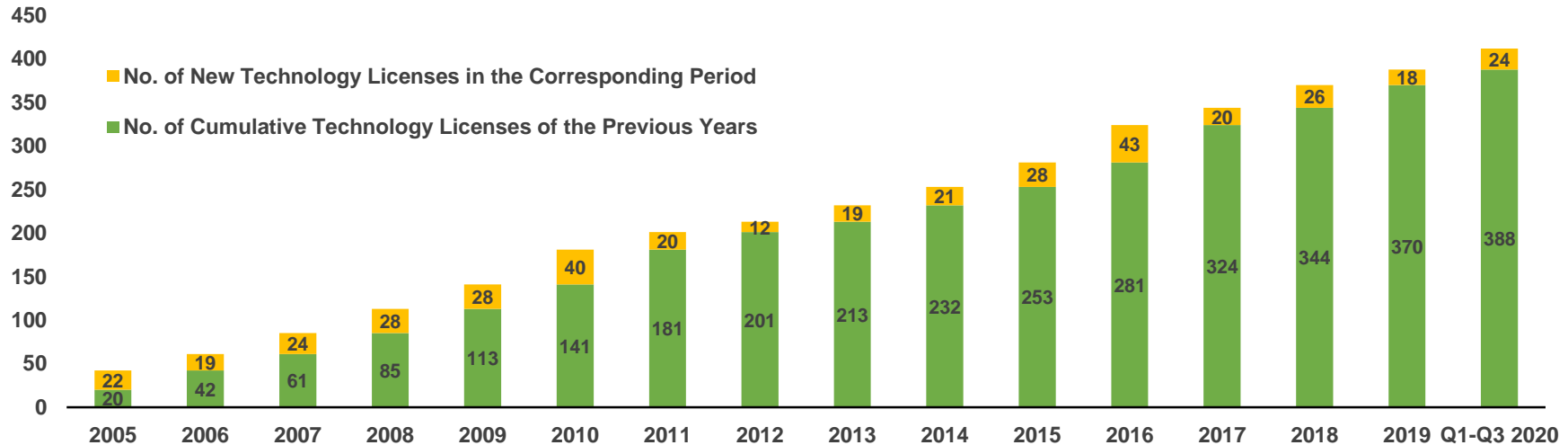
# Technology Licenses

## Cumulative technology licenses

Number of Licenses

| Year    | 2016 | 2017 | 2018 | 2019 | Q1-Q3 2020 |
|---------|------|------|------|------|------------|
| License | 43   | 20   | 26   | 18   | 24         |

Note: Terms (including number of process platforms and licensing fees) for each technology license are set contractually. Payments are made according to set milestones, and there are no particular seasonal factors involved.



# New Technology Under Development

Products in different process nodes

- ✓ New technologies are being developed for 98 platforms by Q3 2020.
- ✓ 7 licensing contracts were signed, 6 for NeoFuse and 1 for NeoMTP.

| Technology | 5/6nm | 7/10nm | 12/16nm | 22/28nm | 40nm | 55/65nm | 80/90nm | 0.11~<br>0.13um | 0.15~<br>0.18um | >0.25um |
|------------|-------|--------|---------|---------|------|---------|---------|-----------------|-----------------|---------|
| NeoBit     | -     | -      | -       | -       | -    | 1       | 2       | 10              | 10              | 1       |
| NeoFuse    | 2     | 1      | 3       | 9       | 3    | 11      | 8       | 1               | 1               | -       |
| PUF-Based  | 2     | -      | 2       | 2       | 2    | 1       | -       | -               | -               | -       |
| MTP        | -     | -      | -       | -       | -    | 2       | 6       | 9               | 9               | -       |

Note: As of Sep 30<sup>th</sup>, 2020

# Technology Development

## Developments by process nodes

| 12" Fabs    | Production | Development | IP Type       | Process Type                                     |
|-------------|------------|-------------|---------------|--|
| 5/6nm       | 0          | 4           | OTP, PUF      | FF   |
| 7/10nm      | 2          | 1           | OTP, PUF      | FF, FF+  |
| 12/16nm     | 3          | 5           | OTP, PUF      | FF, FF+  |
| 22/28nm     | 31         | 11          | OTP, PUF, MTP | LP/ULP/ULL, HPC/HPC+, HV-OLED, DRAM, SOI         |
| 40nm        | 15         | 5           | OTP, PUF, MTP | LP/ULP, E-Flash, HV-DDI/OLED                     |
| 55/65nm     | 25         | 15          | OTP, PUF, MTP | LP/ULP, E-Flash, HV-DDI/OLED, DRAM, CIS, BCD, PM |
| 80/90nm     | 16         | 15          | OTP, MTP      | HV-DDI/OLED, LP, Generic, BCD, CIS               |
| 0.11/0.13um | 17         | 3           | OTP, MTP      | HV-DDI, BCD, Generic                             |
| 0.18um      | 1          | 3           | OTP           | BCD, Generic                                     |
| Total       | 110        | 62          |               |  |

| 8" Fabs           | Development | IP Type  | Process Type  |
|-------------------|-------------|----------|---|
| 90nm              | 1           | OTP      | HV-DDI, LL, BCD                                       |
| 0.11/0.13um       | 17          | OTP, MTP | HV/HV-MR, BCD, LP/LL, CIS, Green, Flash, SOI, Generic |
| 0.152/0.16/0.18um | 17          | OTP, MTP | HV/HV-MR, BCD, LP/LL, CIS, Green, Generic             |
| 0.25um            | 1           | OTP      | BCD   |
| 0.35um            | 0           | OTP      | UHV   |
| Total             | 36          |          |   |

Note: As of Sep 30<sup>th</sup>, 2020

A close-up photograph of a hand dropping a coin into a stack of coins. A small green plant with three leaves is growing out of the stack. The background is a warm, golden-yellow color. A white, brush-stroke-like diagonal line separates the image from the text below.

THANKS

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