eMemory Q3 2020 Results – Earnings Call Q&A

November 11th, 2020

NeoPUF/PUFsecurity/PUF-based Solutions

1. **NeoPUF is currently the only PUF manufacturer that meets the DARPA's 16 requirements of the US Department of Defense for perfect random numbers. Does this have a significant impact on the future global information hardware security?**

   DARPA's requirements are divided into different categories. The first is for PUF to meet DARPA's specifications; the second is the manufacturability of PUF; the third is the reliability of PUF. All these requirements have to be met such that PUF can be applied to the product. In this case, our PUF meets all the 16 requirements. Since PUF is a new technology, the security application has just begun to be noticeable to customers who needs this security solution. We have started to promote our PUF-based technology in North America, and its features are well accepted due to its reliability, stability, and availability in many foundries' platform. If leading companies in North America accept our PUF-based technology for their new generation of product, and other companies see that this technology has become popular for security, this will definitely have a significant impact on the future global information hardware security applications.

2. **The business of the subsidiary PUFsecurity and new employees are both developing and increasing rapidly, and the innovative business model is worth looking forward to. Can you explain this core technology and business progress, in the areas of key management in cloud and Internet-of-Things, the digital signature in Blockchain, and the security authentication in financial transactions?**

   As mentioned during the presentation, our solution can be applied to all these applications as our solution is the fundamental root-of-trust. All these applications

do need highly secure root-of-trust as the basis for their security applications. PUFrt can generate the key, store the key, and provide true random number generation, which can be used in key management of cloud and IoT, signature in Blockchain, and authentication in financial transactions.

3. **It seems that PUF is gaining good traction, could you talk about how big a percentage of your total addressable market would potentially adopt this solution?**

   PUF will be mainly used in security. In the future, the market size for security will be very huge, from low-end edge devices of IoT to high-end CPU, data processing unit, and automotive. If you notice, the US government has started to promote clean network. This clean network requires every devices that connect to the network to be secure, have some level of security, and also the devices need to be certified. Besides the US government, the European community also promotes the security requirement. Hence, market size will be big.

4. **According to your company's current financial report, NeoPUF's revenue contribution is less than 1%, but during TPEX's conference on August 28, 2020, it was mentioned that your company hopes to transform into a 'security as a service' company. Can you elaborate more on the future outlook and vision?**

   We continue to develop our PUF-based security solution from PUFrt, PUFiot, and PUFse. In the coming quarter, in our roadmap, we will develop PUF-based hardware security module (HSM). HSM is used in many servers and big systems to provide security function for the network applications. So, as we continue to make our PUF-based security IP more comprehensive and develop application software interface for customers or individual to use security easily and conveniently. At that time, we will enter 'security as a service'. For example, there are many companies that provide security service such as data encryption

services, or signature services. In the future, as IoT and Blockchain becomes very popular, many individual and companies will definitely request such services then. This is our goal, that our solution should be able to provide very high security with low cost to customers, eventually, in the future.

5. **NeoPUF was about 6% of licencing revenue in Q3. What is the guidance for NeoPUF's share of licencing revenue in a year's time and when will NeoPUF starts contributing to royalties?**

   If you have been following eMemory for years, you will find that, generally, it takes us five to six years to roll out our new technology to the market. NeoPUF has started to contribute license revenue from last year and we see more and more customers' adoption with NeoPUF IP. We have several customers' adoption in their products and they are doing verification. Therefore, we expect the license revenue next year to grow further, and we expect to have the royalty contribution of NeoPUF by the second half of next year.

6. **What are the current alternatives to securing electronic devices?**

   There has been an evolution for security. In the past, most companies used eFuse. They store the key in the fuse, but that is not secure at all, as you can clearly see the data on the burned fuse if you carry out reverse engineering. That is why our OTP, NeoFuse has started to gain market in security. In the next evolution, you can encrypt your key in the burned fuse. If you store your key in the NeoFuse, even after reverse engineering, you cannot see the key. Many companies has started to move to this direction recently. If the company use the key generated internally by the chip such as in PUF, the key can be generated by the chip itself, which is the fingerprint of the chip. So, each chip will have its own secret. That will be the highest root-of-trust, with high reliability. Gradually, with security demand and also higher level of security, it will then move to PUF as the security origin.

7. **Do you expect any security solution that can compete with NeoPUF in the next 3-5 years?**

   We are not the first to propose the PUF concept. It was first provided in 2008. Currently in the market, the first commercial PUF is the SRAM PUF, but SRAM PUF is not stable. If your chip has SRAM PUF as fingerprint, mostly fingerprint will change with time and under different environment and this cause the system to be very unstable, and insecure. As we starts to promote NeoPUF, many customers are interested in NeoPUF because NeoPUF is very secure and stable, which can be used for a lifetime. For the next 3-5 years, we still need to convince customers to use NeoPUF instead of SRAM PUF. We are confident that they will see that NeoPUF is indeed a better solution for them.

8. **What challenges do you face when convincing customers to use your NeoPUF security solutions?**

   This is just like NeoFuse, which takes time to educate customers that NeoPUF is a new technology use to provide higher security. Customers usually ask us to show them track records, and show them evidence on anti-tampering. Security is more of a customized design security solution. So, recently we have a lot of discussions with customers on their anti-tampering demand. Security is different than selling OTP. OTP is for storage function, but PUF is used for security function, and every company has its own security function.

9. **ARM cooperates with eMemory to improve their security level in IoT applications. They develop CPU IP, which is soft IP. CryptoIsland is ARM's highest-level security platform. Why do ARM wants to cooperate with eMemory and not develops its own?**

   There are three aspects. First, eMemory’s OTP offers a better security level as compared to the traditional eFuse. ARM suggests customers to cooperate with eMemory to adopt this higher secure storage OTP solution to protect their keys.

Second, eMemory is a pure-play memory provider, so we can be more neutral in supporting ARM in their cryptoisland solution. Third, customers and ARM would like to work with eMemory using PUF-based security solution because PUFrt performs much better compared with some functions in ARM's trust zone. Some customers strongly request ARM to work with eMemory using PUF-based security solution to enhance their product performance. Above are the reasons why ARM is cooperating with eMemory for security-related segments.

Foundries/Process nodes/Applications/Customers

10. There is currently tightness in the foundry business. Could you discuss the trends in wafer prices for 8-inch and 12-inch?

The capacity in foundry is indeed quite tight recently. We learned from our customers that there is more than double-digit percentage increase in 8-inch and 12-inch wafers. As 70% of our revenue comes from royalty, we expect wafers' ASP increase to contribute to our royalty income growth. We also have a fixed royalty rate, so the royalty that we collect per wafer corresponds to the wafer price. Hence, we will potentially benefit from the increase of wafer prices.

11. You already discussed the outlook for double digit wafer price increase due to foundry tightness but what was the actual wafer price increase for Q3?

Regarding the wafer price, most of the foundries will discuss with customers on the wafer price at the beginning of the year or by the end of the year. So, for the wafer price increase, we expect it to happen starting next year.

12. What are your revenue share gains in Chinese foundries?

Chinese foundries in terms of revenue contribution is less than 10% of our revenue. Chinese foundries are mostly working in legacy process nodes or 8-inch wafers, so the contribution to eMemory is quite low.

13. **What is the progress on the advanced 12-inch nodes and what are the target applications? What is the revenue contribution now and when can we expect fast ramp?**

    We are developing 5nm process nodes. For 7nm process node, we have been qualified two years ago. For advanced nodes we are now engaging with customers in several field including AI chip, automotive, multimedia, and FPGA applications. As for the revenue contribution of 12-inch, they are mainly from OLED, TDDI, and some multimedia chips such as DTV and STB. We expect the fast ramp to come from more adoption in OLED, WiFi, and ISP applications. Furthermore, we have observed our customers in ISP product application moving into the production stage and might soon contribute to our royalty.

14. **What is the power management IC royalty addressable market for 5G vs. 4G?**

    When smartphones move from 4G to 5G due to more complicated system requirements, more PMIC will be needed. In terms of the content, the number of chips will be three to five times compared to the previous generation. In terms of wafer area, we believe that 5G has a 30% increase of wafer consumption compared with 4G.

15. **Rumor has it that the Korean brand (Samsung) is planning to launch their flagship phone early. Does eMemory continue to cooperate with the Korean brand on their new product?**

    Currently, we are working with the Korean customer on their development of new product. Not only that, we also support them for their production of new product. So, the project with the Korean customer is unchanged and will keep on going. There is more than one product chip solution using our IP. We not only work with them on their smartphones, but we also work with them in their foundry segment. We expect more and more applications embedded with our IPs in the future.

Memory

16. What is the memory progress? What is the contribution to licensing and royalty now and in the next few years?

Our DRAM customer, in 25nm process node, has already move into production and thousands of wafers are produced every month. We are now working with our customers in 20nm process node and this project will start very soon. Therefore, royalty contribution will mostly happen next year.

17. Can you talk about the potential threat of competitive technology such as MRAM?

We have cooperate with US companies on embedded MRAM technology. There are two different applications for MRAM: the embedded application, and the standalone application. For embedded MRAM, it's basically to replace embedded flash beyond 28nm process nodes as there are no embedded non-volatile memory solution which can be used. Now there is another application that is trying to use MRAM to replace SRAM as the power and leakage of SRAM becomes big, it is difficult to be scaled, unlike MRAM. Thus, the power consumption of MRAM is much smaller. If we have embedded MRAM technology, we will extend our applications into embedded flash. So far, we have no applications in embedded flash, but if we successfully deliver embedded MRAM technology, then we will have additional market application. We are not competing with MRAM, but instead MRAM represents an opportunity for our company as we are working with a partner on MRAM.

Operating expenses

18. Could you discuss the reasons for the increase in operating expenses? Is this because of higher spend on the opportunity in PUF?

The increase in operating expenses was because of a tax exemption approval flow deferment of a Chinese foundry. So if we exclude this, the expenses is mainly

caused by the manpower increase in PUFsecurity and PUF-related R&D development.

19. **Do you expect the Chinese foundry expense or deferment in Q3 to be reversed in Q4? Please explain.**

    We take a conservative practice. As this is the largest foundry in China, the amount is not a big one to them. If we do not receive the account receivable on time, then we will put it as expense. We expect the amount will be reversed back into our account in Q4.

20. **What is the total size of the account receivable from the Chinese foundry?**

    The amount that did not enter our account is NT$ 11.23 million.

Revenues & outlook

21. **What if 12-inch products ratio lifts up to 50% of the total revenues from 37.3%, at that time, how about the growth rate of the total revenues?**

    We expect growth rate of 12-inch products to continue to outpace 8-inch, as OLED, ISP, multimedia, connectivity product applications are ramping up. The ratio of 12-inch royalty will be more than 50% soon.