eMemory Q1 2021 Results – Earnings Call Q&A

May 12th, 2021

Applications/Customers/Process/Revenue/Outlook

1. **What is your strategy to increase your IP adoption rate in 16nm and below?**

   The current technology widely adopted for 16nm and below is eFuse, which is offered by the foundry as a standard cell.

   In comparison to eFuse, our technology's performance is superior in terms of its smaller size, lower power consumption, and higher security protection for data storage. Since NeoFuse issued its patent in 2013, we have developed more than 200 platforms and have designed solutions for more than 300 products.

   As customers move into production they will be contributing significantly to our royalties, however, most importantly is the accumulation of our production record. We can also see the increased adoption rate for 16nm and below. This implies that the 28nm customers are migrating into leading-edge process nodes. As this happens, we predict that new customers and new applications will shift from the generic eFuse to our solutions due to performance and security concerns.

   In addition, as we mentioned previously, traditional eFuse is no longer secure and cannot offer higher density for customer use. Together with eMemory's NeoPUF technology and our subsidiary PUFSecurity's security IPs, we are happy to see our IP deployment becomes faster. As you all learn from the recent news, hacker attack is getting severe. I believe chip makers, especially for those who provide complex SoC chips in advanced process nodes, will surely consider the necessity to enhance its product security level and to deploy hardware security function against the increasing security risks. This is our strategy to enhance and increase our IP adoption rate in leading edge process nodes.

2. **What is the impact on foundries aggressively increasing CapEx to build more capacity?**

Considering the return from CapEx increase, frankly, most foundries are very conservative. But, the fact is, not only advanced process nodes, due to the increasing needs from specialty and mature process technologies, like CMOS Image Sensors (CIS), Power management and Connectivity IC for IoT, as you all learned, the increasing capacity across foundries cover wide process nodes. The current shortage of foundry capacity creates opportunities for us. As our competing technology is the foundry-based internal solution – eFuse, customers require multi-foundry solutions more than ever to diversify their supply chain. Our technologies are widely deployed across most foundries, from legacy nodes to leading process nodes. By adopting our IPs, customers can guarantee a higher level of flexibility in terms of their production plan, allowing them to move from one fab to another. In addition, the current foundry pricing is favorable to us as our royalties are based on a percentage of the wafer price. The increasing CapEx leads to more foundry capacity, also an increase to our total addressable market.

3. **The latest 7nm chips from global FPGA manufacturers (Achronix...) have announced their cooperation with eMemory. Does this mean that eMemory's higher level of data security protection IP will reach the mainstream market?**

We believe so. Our security solutions, combined with NeoFuse and NeoPUF, are set to be fully introduced in the advanced FinFET process, expanding their application. We are confident that our PUF-based solutions provide the highest level of security when compared to the competition. We are well placed to 'cross the chasm' into the mainstream market as customers shift their production. Many potential customers that are waiting for a clear leader to emerge before adopting

a solution. Our growing production record and superior benchmarking lead us to believe that this will likely be our IPs.

4. **All foundries have a full capacity, and wafer prices have also increased. Why did April revenue drop compared to January revenue?**

   If you look at our revenue pattern every year, April is always lower than January. There are two reasons behind this. The first is, our largest end-customers are US smartphone-related chips, which have very obvious seasonality. Q1 is always a low season for wafer shipment which contributes to our April royalties. The second reason is the semi-annual royalty recognition of one of our Chinese foundry partners, making quarterly revenue comparison unequal.

5. **UMC's wafer prices continue to increase from each quarter. What is the impact on the company's profitability?**

   Our royalties are based on the percentage of wafer price, so, it is correlated to foundry pricing movement. So, wafer price increase will help our company's profitability.

6. **Does there remain any room for the 8-inch penetration rate to grow from the current 20%, or are there any applications still growing their market share in 8-inch?**

   Our penetration will still have room to grow in 8-inch. Recently, we have developed NeoPUF in an embedded flash process called 'Secure Flash', which can increase our market share across the embedded flash platform. There are some legacy chips, like power-related IC, that still use conventional laser trimming or eFuse. We are seeing these customers shift to our IP solutions for their new products. Also, the increasing demand for Automotive and IoT applications in 8-inch, which requires a higher level of security and better reliability, will also increase the adoption rate of our IPs.

7. **Your IP on DDIC and PMIC is already used as an industry standard. Are there other applications where potentially eMemory's IPs could also achieve this position?**

   There are many applications with the adoption of our IPs, for example, ISP, DRAM, DTV/STB, Bluetooth, WiFi, and etc. Typically, once a customer adopts our IPs they achieve better performance over their competitors, leading to a market share gain. So, we expect their competitors to follow on by adopting our IPs. We have seen this scenario in the past with applications such as DDI, PMIC, and Fingerprint sensors. Therefore, we believe that it is just a matter of time for our IP to be widely used in those applications.

8. **What are your opportunities in Automotive applications?**

   Our IPs can be applied to various applications, ie. Advanced Driver Assistance Systems (ADAS) (which we have customer tape-out in 7nm and 16nm), Sensors, Microcontrollers, Power Management IC, and Display Driver ICs for infotainment. In addition, autonomous driving requires the highest standard of security. Therefore, our PUF-related solution will be widely adopted.

9. **Will the collection of royalties from design companies be the same as foundries in the first month of the following quarter after production? How are royalties paid and what are the payment methods?**

   Currently, eMemory collects royalties from foundries and IDMs. Only when design houses adopt our subsidiary PUF security solution, there will be extra royalty incurred. The payment will be the same time as their wafer shipments of foundries. We also charge by percentage of wafer price.

10. **Will customers who use the NeoPUF process platform also use NeoFuse simultaneously?**

    Yes, firstly, NeoPUF is based on NeoFuse process platform. And, customers use NeoPUF for security key and UID generation. So, customers will surely need OTP IP together for security usage.

11. **How many 7nm tape-outs are there? When will production be expected?**

    We now have 5 product tape-outs in 7nm and expect production with royalty contribution later this year.

12. **What is the progress on 6nm and 5nm process nodes?**

    As reported just now, IP development in 6nm and 5nm are running smoothly, as schedule. 6nm is in qualification stage and expected to complete qualification in Q3 this year. For 5nm process node, we just received the test wafers from the leading foundry partner and expect to complete verification in Q3 as well.

13. **In the revenue disclosed each quarter, can you further subdivide the proportion of 8-inch and 12-inch?**

    As I just reported and please refer to page 9 in presentation material, the royalty from 8” and 12” accounted for 54.8% and 45.2% of overall royalties, respectively.

14. **Please explain the competition and collaboration relationship with ARMv9.**

    There is no competition as we work closely with ARM. ARM offers CPU IP whereas eMemory offers logic NVM and hardware security IP. For the increasing demand in higher computing performance as well as security level, the collaboration between the two parties will become closer. ARMv9 is a CPU solution, and we support ARMv9 to have a better security level.

15. **Have DRAM customers started production? When will there be royalty contributions?**

    Yes, DRAM customers are ramping up production now, and will contribute to royalties more significantly starting July this year.

16. **Can you provide the outlook for AMOLED DDI, ISP, DRAM, WiFi and DTV for this and next year?**

    These applications indeed are the main growth driver for this year. For OLED DDI, we are gaining new Korean OLED customers which are dominating player in OLED DDI. OLED, ISP, DRAM, WiFi will manufactured in 28nm, which have much higher ASP, and will contribute significantly to our royalties. We expect their product volume will increase significantly next year and drive our royalty growth further. DTV customers are migrating into 16nm and will be in production in second half, which have higher asp and higher royalty contribution.

17. **What safety measures are being taken to ensure the safety of your employees in this changing pandemic environment?**

    As you know in Taiwan, we are facing increasing numbers of infected cases these days. We have some measures taken, and are always paying close attention to the actual pandemic situation domestically. Basically, we require our employees to take body temperature measurements when they arrive at the office. We also request employees to have meetings online rather than visiting customer onsite. This reduces the risk of our employees and customers from getting infected. In the meantime, we follow the latest progress and the government's regulation in taking any related actions. We are considering starting work-from-home (WFH) for our employees so that we can secure our business and also keep employees safe.

18. For new IP technology development, 6nm and 5nm plus has good results. What is your customer applications in 5nm plus?

As we mentioned, for all IPs in the leading process nodes, the major applications will be security related. When we move into 5nm and 6nm, our customers are in FPGA, DPU, and graphic chip segments. All these products are high performance computing (HPC) related products. So, for 5nm, 6nm, and even 3nm, we will work closely with those customers.

Security/PUF

19. Recently, international hackers have been rampant, and the issue of information security has evolved into a national security issue. Some media reports:

(i) **Hacker attacks shut down major oil pipelines, U.S. declares a state of emergency.**

(ii) **Extortion virus heats up the Information Security Industry: Every 10 seconds in the world, a company suffers.**

So, can eMemory's hardware security IP protect against such hacker attacks? Will the adoption of the applications be accelerated?

There are so many attacks on software nowadays, so, software security is no longer enough to protect the systems. So, Yes, the adoption of high-level security will be accelerated, and eMemory's PUF-based security offers unique identity, secure storage, authentication and anti-counterfeit features and can protect against such attacks. Large system companies are focusing on creating 'Zero-Trust' network solutions that requires every device to perform verification, authorization, and authentication. This could be provided by a hardware PUF key (which can be easily self-generated by PUF in the device) to protect the system security through the hardware.

20. Can quantum computing be able to crack eMemory's PUF? Is NeoPUF still useful for future quantum computing?

Quantum computing cannot crack down eMemorys's PUF. Quantum computing offers super computation power and can only use 'brute force' to try every combination from a huge pool of numbers to find the right number. As Charles explained in previous investor conference call, eMemory's NeoPUF technology is based on existing CMOS process. It features 100% randomness and robustness. Because of its unique features, product designers can easily have sufficient security key bit-steam (that is so-called a longer key length). With that, this would be harder than identifying a single grain of sand across the whole earth, in a very short time. So, it is very unlikely.

21. The DPU of most AI chips is responsible for the security function. How does the company introduce NeoPUF into the design architecture of the DPU? How is the growth momentum of the DPU?

In the IoT era, there is a lot of data needed to be taken care of. Many cloud-based application will be realized 5G. If you depend on CPU alone, the CPU efficiency will be low because it has to take care of the network service, application service, and data storage. Therefore, DPU becomes popular recently as DPU will share with CPU, takes care of the data storage, and all the security activities. So, we have integrated NeoFuse and NeoPUF with digital design to perform hardware root of trust functions to be embedded into DPU. With NeoPUF, we have innovated a new security architecture for root of trust which achieve high level security.

22. What are the differences in architecture between Apple's Security chip T2 and our NeoPUF? What are the advantages and disadvantages?

Apple's T2 is using a separate secure element chip (not PUF-based) to perform the security functions. The trend to high security is to embed secure element into

the SoC. Our PUF root of trust and secure element are the key security IPs for embedded solution to facilitate higher security solutions. In the future, security functions will be all embedded into the SoC.

23. Who is your competitor in 'Zero Trust' security? Does someone else offer this?

We are a security root of trust provider for 'Zero Trust' security as 'Zero Trust' security is a huge regime (not a product). There is a couple of competition in providing hardware security to security solution in the market, which is competing in intrinsic ID for PUF, security IP will be inside secure or secure IC companies. Even if there is a few competition in security provider, eMemory alone has the complete solution, with PUF and OTP, and solutions with digital design for integrated PUF with OTP and TRNG.

24. Please explain what HSM is?

HSM (Hardware Security Module) is basically putting security into hardware, which can provide security services such as encryption, authentication, authorization, and data integrity. HSM can provide key generation, key storage and crypto engine to provide all kinds of security services.

25. Could you give an example of how the security application in the remote working would impact the user?

FIDO society has come out with a standard device ID standard and promoting that for the future IoT device ID. So, for the device ID, previously, ID was only identity number; in the future, ID will become device ID (active ID), which provides unique ID and authentication function. Hence, in the future, for people working remotely, it is better to have an active device ID, which can protect their assets and data. The impact would be that all devices connecting to the internet require to have more security. This means that, as more people work remotely,

hardware security will have increasing demand by the industry and by people worldwide.

26. Can you share more on the progress with ARM's collaboration?

ARM is a good and successful company in providing high computing CPU. For security operations, in addition to CPU, you need to have good crypto engine for the computation and high speed calculation of security. ARM provides computation capability for encryption and security services. Therefore, eMemory has complementary expertise with ARM. For security, the most important thing is how to generate the key and how to store the key. eMemory provides integrated PUF, OTP and PUF-based TRNG to generate the key, and secure key storage. Together with ARM, we can provide the total solution for security processors and security services. Both companies co-work to provide customers with high level and high performances security solutions. We also got successful results from customers we engaged with. In the future, we will work even closer together to provide security IPs, security processors, and security solutions to customers.