

Teramikros



Shigeru Koshimaru, President, Teramikros

Teramikros talks about joining the Tera Probe group, capacity plans

Japan-based Teramikros specializes in the manufacture of wafer-level packages. Mr. Shigeru Koshimaru, President of Teramikros, Inc. talks to Yole Développement in an exclusive interview, about becoming part of the Tera Probe group, how their combined synergies will be harnessed, and its plans to increase production capacity.

Yole Développement: Can you introduce us to Teramikros, and explain the company's relationship with Casio Micronics and Tera Probe?

Teramikros: Teramikros was established as the successor company to Casio Computer Co. Ltd.'s wafer-level packaging (WLP) business. And on October 1, 2011, the entire business—including employees, equipment, and intellectual property related to the WLP business—were transferred from Casio Micronics and Casio Computer Co. to Teramikros. At the same time, Tera Probe purchased 100% of Teramikros' shares from Casio Computer Co.

YD: How are you harnessing the combined business and technology synergies of Tera Probe and Teramikros?

T: Tera Probe, as the parent company, is primarily involved in wafer probing testing services, while Teramikros is a truly 'turnkey' WLP service provider. Tera Probe's wafer-level testing capability is compatible with Teramikros' WLP products. At the same time, Teramikros' broader customer base should help Tera Probe expand its test services business. Since Teramikros is now positioned as a strategic company within the Tera Probe group,

we expect a more aggressive investment in R&D and manufacturing of WLP, which was somewhat limited under the previous ownership.

YD: Where are your operations based, and what are your production capacities?

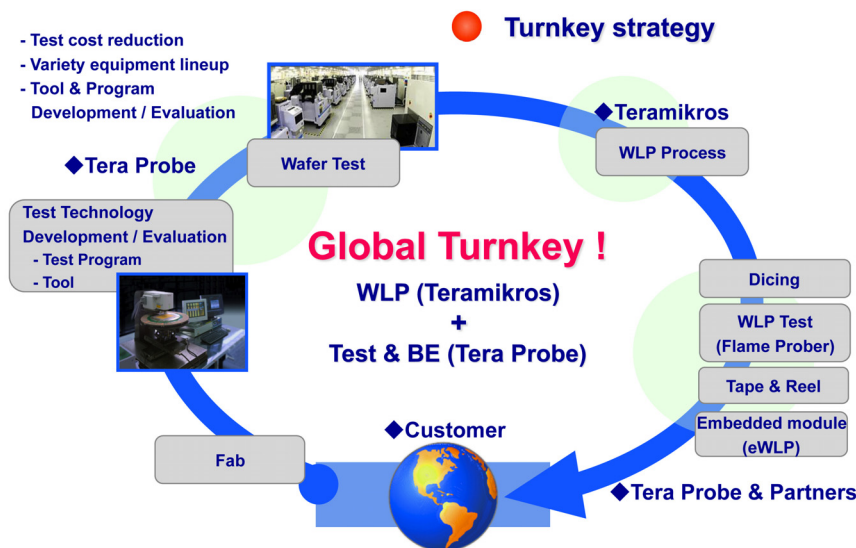
T: There have been no changes in our operation; everything related to WLP production was transferred to Teramikros from Casio Micronics. Our employee headcount is approximately 300 today, and we're still located in Ohme City, a suburb of Tokyo. Our production capacity is 30,000/month for 8-in. and smaller wafers, and 3,000/month for 12-in. wafers. We also have a licensee in Nantong, China, which will help create additional manufacturing capacity for 6-in. and 8-in. wafers in the first half of 2012.

YD: Teramikros specializes in wafer processing of redistribution layers (RDL) and galvanic growth of copper posts (front-end-of-line of the eWLP process), can you describe your business model and operations?

T: All of these wafer processes are done at our Ohme plant. For solder ball bumping services, also done in Ohme, we partner with Nippon Steel Materials Co.—including solder ball material development. For dicing, tape and reel, and testing, we are responsible, but have relied mainly on outside partners. From now on, with Tera Probe as our parent company, we can better serve our customers more flexibly, complying with various customers' requirements. In regard to design work, we used to provide all design work after the repassivation services. Lately, we are seeing more semiconductor companies design their ICs for WLP and we're cooperating with our customers by providing design rules for WLP. We believe this is clear evidence that WLP is becoming standard in packaging design.

YD: Teramikros has 12-in. wafer diameter WLP fab capacity. Any plans to expand this capacity? Where are your customers located?

T: In our Ohme plant, we can expand our 8-in. capacity from the current 30,000/month



Teramikros synergies into a full turnkey service with parent company TeraProbe (Courtesy of Teramikros)

to 50,000/month; our 12-in. capacity can be expanded from 3,000/month to 8,000/month. Since we see strong demand for our WLP, we are also considering offshore manufacturing in Asia and other overseas area. We began looking into offshore manufacturing, including the possibility of joint ventures and licensing, such as we did for our partner in Nantong, China.

Approximately 30% of our revenue today comes from overseas. For the Japanese market, we still see more room for new applications and customers, but we see bigger growth potential with overseas customers. This is one reason why we're considering capacity expansion and offshore manufacturing.

YD: What benefits can embedded WLP (eWLP) technology provide?

T: We promote our eWLP as a basic technology concept for embedding. To make semiconductors suitable for various types of embedding technology, we propose our eWLP as having the same structure as our WLP—using copper post and encapsulation, but without solder balls. We believe our eWLP is an enabling technology that contributes significantly to higher quality, reliability, and lower cost.

YD: Are you seeing a trend toward larger WLCSP dies?

T: Yes, we're seeing this trend. WLP isn't necessarily a technology for smaller chips, and it can be applied to bigger ones. We must consider, however, embedding solutions as well, since using WLP only for surface-mount technology has technical limitations. Our eWLP enables a bumpless build-up layer (BBUL), which Intel proposed 10 years ago. In his keynote speech at the MEPTec conference in 2004, Dr. Thomas Di Stefano also predicted this roadmap.

Embedded WLP PoP Type Sample

P40

Teramikros

Mobile Phone Application Processor

PoP Structure (EWLP)

Embedded WLP

- Size : 4.46x5.21mm
- Thickness : 0.15mm
- I/O : 270 posts
- Pitch : 0.25, 0.30mm

WLP(SMT assembly)

- Size : 5.42x4.80mm (body)
- I/O : 90 balls
- Pitch : 0.5mm

項目	仕様
L/S	30/30μm
IVH穴径/ランド径	100/250μm
IVH間Minピッチ	350μm
LVH穴径/ランド径	*50/130μm
LVH間Minピッチ	175μm
Ball Pad部のLVH	オフセット
Ball Pad	SMD

*電線径は30μm前後

EWLP® PoP cross section

A PoP construction using embedded chip technology for the bottom package. Both top and bottom ICs are wafer level processed by Teramikros. (Courtesy of Teramikros)

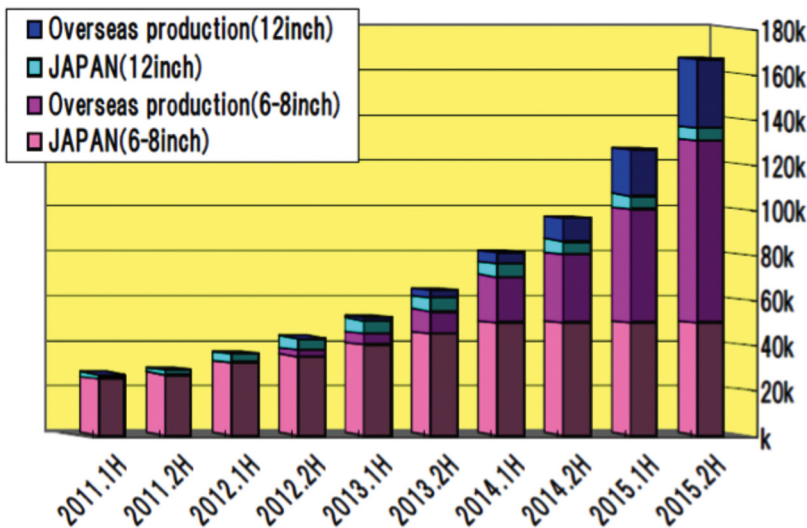
YD: Does Teramikros plan to offer RDL processing services for applications other than WLCSP?

T: We do offer RDL and balling services for certain customers today, but we believe our mainstream business will grow and evolve around our WLP and eWLP technologies.

YD: Will CMOS foundries keep investing in RDL processing services? What effect will this have on Teramikros' business?

T: Since WLP is fundamentally a wafer process, it makes sense that CMOS foundries will expand their RDL services. We would welcome such a move by the foundries, and consider partnerships with them.

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Teramikros' capacity expansion plan. (Courtesy of Teramikros)