

# Global and China Advanced Packaging Industry Report, 2009-2010



In this report, advanced packaging refers to leadframe-free packaging, mainly CSP and BGA. Advanced packaging is mainly applied in mobile phone, CPU, GPU, Chipset, digital camera, digital video camera, and FPTV, of which mobile phone employs advanced packaging the most since an average of approximately 12-18 pieces of IC in every single mobile phone is in need of advanced packaging, which shapes the advanced packaging market of almost 18 billion pieces; followed by computer CPU, GPU and Chipset whose unit price and gross profit are far higher than that of mobile phone IC packaging despite the smaller quantity.

## Revenue and Growth of Global Top 20 Packaging & Test Companies, 2009-2010

	Region	2009 (US\$ mln)	2010 (US\$ mln)	2010/2009 Growth
Advanced Semiconductor Engineering Inc. (ASE Inc.)	Taiwan	2599	3875 (merely the revenue from packaging & test business)	49.1%
Amkor	North America	2179	2780	27.6%
Siliconware Precision Industries Co., Ltd. (SPIL)	Taiwan	1724	2004	16.2%
STATS ChipPAC Ltd.	Singapore	1326	1646	24.1%
Ibiden	Japan	1170	1344	14.9%
Shinko	Japan	998	1310	31.2%
Powertech Technology Inc.	Taiwan	904	1196	32.3%
Unimicron	Taiwan	382	927	142.6%
Nan Ya PCB Corporation	Taiwan	615	852 (merely the revenue from packaging & test business)	38.5%
SEMCO	South Korea	471	627	33.1%
ChipMOS TECHNOLOGIES (Bermuda) LTD. ("ChipMOS")	Taiwan	380	528	38.9%
King Yuan Electronics Co., Ltd. (KYEC)	Taiwan	382	469	22.8%
Kinsus Interconnect Technology Corp.	Taiwan	336	464	38.1%
Formosa Advanced Technologies Co., Ltd. (FATC)	Taiwan	271	439	62.0%
Chipbond Technology Corporation (Chipbond)	Taiwan	158	420	165.8%
Unisem	Malaysia	294	388	32.0%
STS Semiconductor	South Korea	162	373	130.2%
Greatek	Taiwan	262	372	42.0%
Jiangsu Changjiang Electronics Technology Co., Ltd (JCET)	Mainland China	187	241	28.9%
Nepes	South Korea	80	134	67.5%

In 2010, the global packaging & testing industry obtains the output value of nearly US\$46.15 billion, among which, IDM enjoys US\$24.01 billion, and the outsourcing packaging & testing provider (SATS) occupy US\$22.14 billion. It is observed that the proportion of world's packaging & testing industry in the output value of global semiconductor industry climbed to 18.1% in 2009 from 17.5% in 2004, and it can promisingly reach 19.5% by 2013. The packaging & testing industry has become increasingly important in semiconductor industry. The output value of packaging & test industry worldwide in 2010 rises 22.8% or so from 2009 and the growth margin of SATS is close to 30.5%. In particular, the advanced packaging providers experience an even higher average growth of about 36.5%, the highest level ever since 2000.

Packaging has played a more and more important role. Take the baseband MT6253, a highly integrated IC of MediaTek, as an example. If it adopts MediaTek's consistent TFBGA packaging, the packaging area will be around 14\*14mm with poor EMI/ESD performance and heat dissipation. So, MediaTek seeks help from ASE Inc. who accordingly develops aQFN packaging that shall reduce the area to 11.5\*11.5mm, moreover, the material cost of QFN packaging leadframe is only 1/3 that of BGA. In fact, cooperating with Mitsui in patent, ASE Inc. started R&D in 2007Q3, purchased machines from 2007Q4 and accomplished verification in 2008Q3. However, the pitch of aQFN packaging is relatively small forasmuch the SMT production lines of small factories in mainland China cannot get with it, resulting in the low yield rate at the initial stage; but the yield rate has been much improved after a long period of great efforts. MT6516, the mobile phone baseband of MediaTek, has a pitch of only 0.378mm, far smaller than that of MT6253. Apparently, the SMT production lines of small factories of emulational products cannot cope with such small spacing.

In 2008, Infineon launched PMB8810 that employed eWLB packaging provided by STATS ChipPAC Ltd. It is a kind of embedded wafer level packaging and the upgrading version of WLCSP packaging, with the packaging size of only 8\*8mm. As the world's smallest and most highly-integrated baseband processor, it also favors 6-layer PCB and reduces cost. LG has largely adopted PMB8810, e.g. GU230, T310, T300, GD350, GB220, and GS170, so have Samsung's S3350 and Nokia. The global shipment of PMB8810 in 2009 hit 35 million.

In respect of technologies in 2010, the popular TSV technology makes slow progress. TSV has to solve quite a few technical problems and holds high cost against still immature technology and no unified standards, 3-5 folds higher than that of SoC or SiP design which shares the same function or performance. TSV memory which is originally anticipated to mushroom in 2010 failed to make its debut so far and it is predicted to be rolled out massively in 2011, while the Logic +Memory type TSV IC emerges roughly 1-3 years later than expected with not so large application numbers. In the future, TSV will be still primarily applied in CMOS image sensor and stack memory. Fan-Out WLCSP packaging starts to stand out conspicuously in 2010.

In regard to industry, ASE Inc. (an average of 2-3 acquisitions per annum), the global No.1 packaging & test company, purchased 59% equities of Universal Scientific Industrial Co., Ltd. (USI) for nearly TWD13.5 billion in February 2010 and the shareholding ratio of ASE Inc. reached 77%. USI is the downstream manufacturer of ASE Inc.'s clients, and after the acquisition, ASE Inc. has further stabilized the orders, the estimated main business revenue in 2010 will see a growth close to 50%. In August 2010, ASE Inc. invested US\$67.68 million to acquire Singapore's EEMS, intensifying its strength in test business. In December 2009, the global No.2 LCD packaging & test company- Chipbond-acquired International Semiconductor Technology Ltd. to become the world's largest LCD packaging & test enterprise, and the revenue of Chipbond will experience a growth of 165.8% in 2010. At the end of December 2009, Unimicron officially amalgamated with Camel Precision Co., Ltd., and its revenue in 2010 is predicted to witness a growth margin of 142.6%, and it will climb to the global No.3 IC substrate manufacturer from the current 5th position worldwide. Subordinated to Samsung, South Korean STS Semiconductor has flooded into logic IC packaging & test field from memory packaging & test, and its revenue is expected to see a growth margin of 130.2% in 2010.

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