Rising Markets for ICs

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If you are a hungry smart phone owner who wants to know the whereabouts of local restaurants, there is an app for that. Want to know how foods with bar codes are rated nutritionally? There is an app for that as well. More and more people are obtaining smart phones, giving them access to a wealth of information literally at their fingertips through the Internet.

In 2011, 242 million smart phones were sold. With an outstanding compound annual growth rate (CAGR) of 15.2 percent through 2015, 416 million will be sold in that year.

The more sophisticated the phone, car, or what-have-you, the more electronics are stored within. This makes for good business for the IC industry, which has a unit CAGR of 7.3 percent through 2016 (see Figure 1 below).

Figure 1 IC Unit Forecast, 2010–2016

IC revenue is growing at an even faster CAGR of 7.8 percent through 2016, with packaging revenue being about 15 percent of that total, as seen in Figure 2.

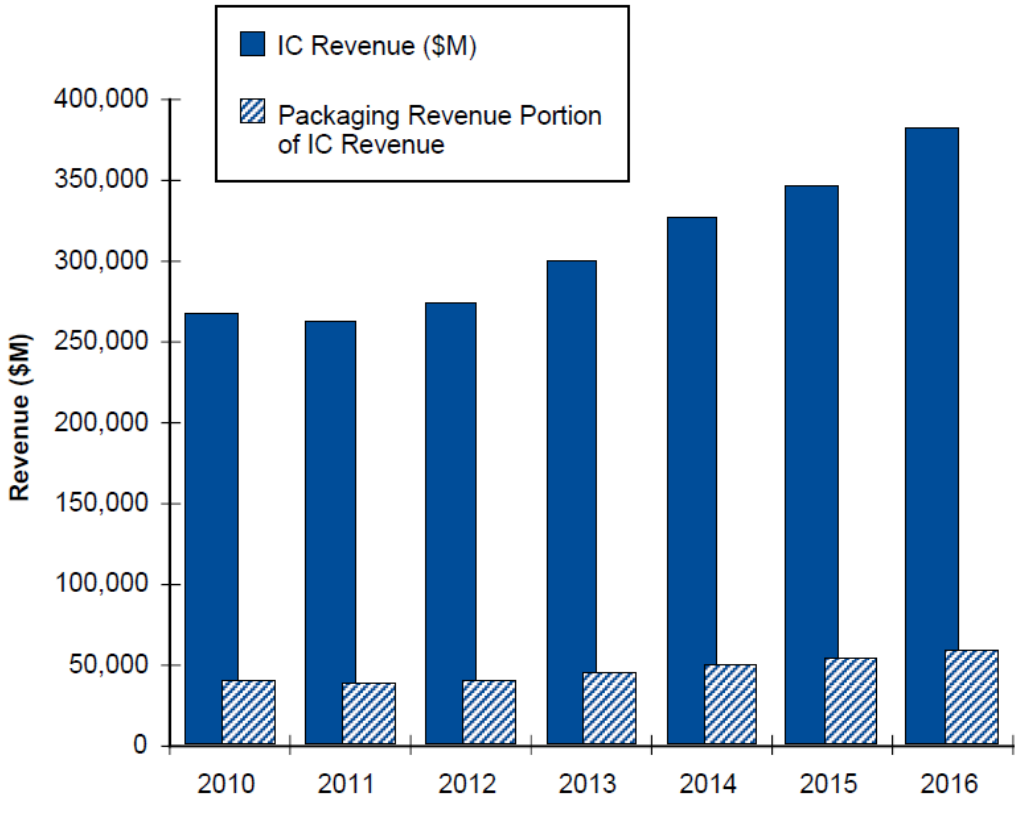

Figure 2 IC Revenue Forecast, 2010–2016

The packages with the highest unit growth rate to house all these ICs include the WLP at 13.9 percent CAGR through 2016, QFN at 11.8 percent, DFN at 10.7 percent, and BGA at 10.5 percent. SOs, however, still garnish the largest share of the unit sales, as seen in Figure 3.

Figure 3 - IC Unit Forecast by Package Family, 2011 vs. 2016

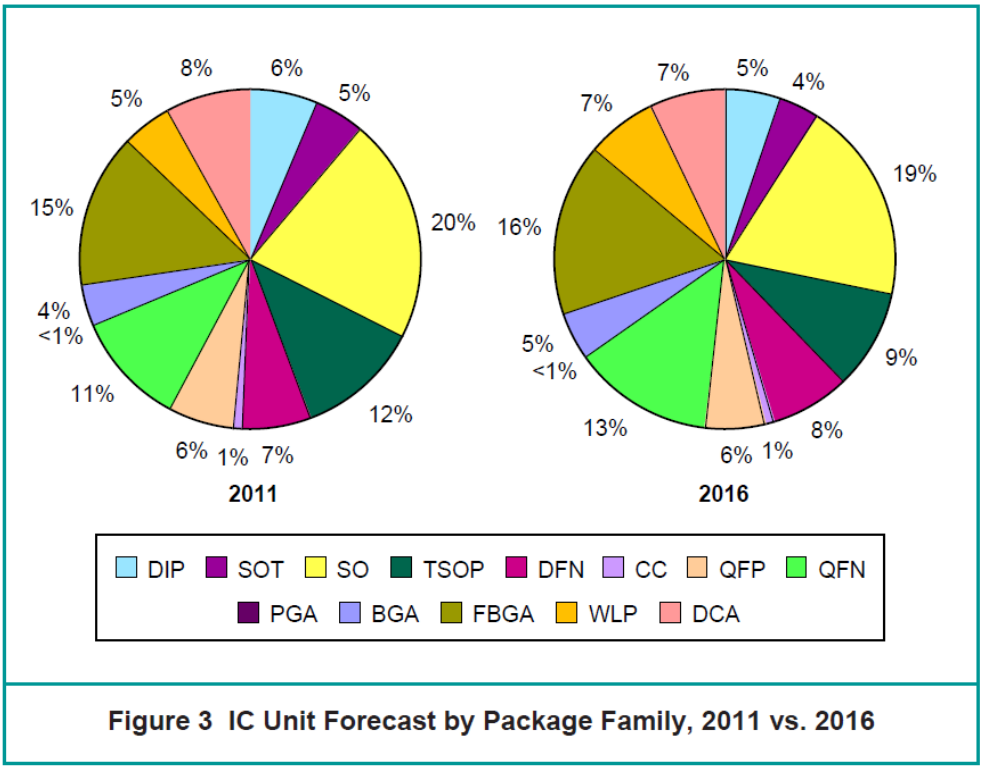

Figure 3 IC Unit Forecast by Package Family, 2011 vs. 2016

Within the huge variety of ICs, those being created in the greatest numbers include voltage regulators, standard logic, DRAM, and flash. From a revenue standpoint, the highest performing devices include special-purpose logic (SPL) for computers (including graphics, chip sets, etc.), DRAM, SPL for communications, standard cell and PLD, and flash. The most popular packages and I/O counts within each of these categories are:

Device Type	Most Popular Package and I/O Count Range
Special purpose logic (SPL)—computer (graphics, chip sets, hard disk drives, etc.)	BGA 300 I/Os and up

SPL—consumer	FBGA 104–304 I/Os
DRAM	FBGA 34–100 I/Os
Flash	FBGA 34–100 I/Os
Standard logic	SO 4–32 I/Os
Standard cell and PLD	BGA 104 I/Os and up
Voltage regulators and references	SOT, SO 4–18 I/Os, DFN 4–18 I/Os, WLP 4–18 I/Os, QFN 4–32 I/Os

Increasing Capability

The demand for increased high-speed bandwidth is generated by the use of the Internet. YouTube and other graphic media consume an enormous amount of bandwidth. I once heard a statistic to the effect that if all the information provided in all of the yellow pages ever published in the United States were uploaded onto the Internet, it would be less data than is uploaded onto YouTube in a single day, or something of that order. People are expressing themselves on YouTube, Facebook, Twitter, and the like, and sharing camera phone photos by uploading this information onto the Internet and e-mailing it to friends, all at an amazing rate. People want to be able to take streaming videos at a vacation spot, as the scenery unfolds before them, and immediately send them to their friends and loved ones so they can share that sense of ahh in real time. The demand for social media is ever increasing, and technology must be furthered to meet this demand. One method of meeting these demands is with the use of TSVs.

Devices that are high on the overall revenue list—DRAM, SPL for communications, standard cell and PLD, and flash, plus MPU—also incorporate through-silicon vias (TSVs) within their packages for 3-D interconnection.

3-D TSVs are incorporated into IC packages as a method to interconnect two or more stacked die, with vias going through the bulk silicon of the lower die to connect to the package substrate. A variation on this idea is the notion of 2.5-D, where devices are sitting side by side on a common interposer. This interposer can be used to fan out or reroute the electrical traces of a device while routing the traces to the package substrate below, connected with microbumps. Silicon interposers accommodate the CTE mismatch between the silicon die and package substrate, acting as a stress reducer, thus improving reliability.

By moving to 3-D interconnection, the device can achieve 100 times the connectivity or bandwidth, with less power consumption. With lines and traces on the silicon die moving to 45-, 32-, and 22-nm lithographies, utilizing TSVs is a way for the back-end interconnection to keep pace with the front-end manufacturing. Reduced parasitics and smaller form factors are other benefits of 3-D interconnection.

Potential markets for TSVs as described above will grow from 39 billion units in 2011 to 54 billion in 2015, with a 9.1 percent CAGR during that time period. The revenue for these markets is substantially higher, at $154 billion in 2011, growing at a CAGR of 8.1 percent to $214 billion in 2015.

TSVs are found in FBGAs, BGAs, and WLPs. These packages, along with QFN and DFN packaging solutions, have the highest unit growth rate of all IC package types. Advances within these package families, such as fan-in WLP and fan-out QFN, are extending the reach of these packages, and are allowing for new products to be developed and ushered into the marketplace at prices that consumers are willing to pay.

More information on IC packages, their advancements, and the markets they serve can be found at the following website address:

http://www.newventureresearch.com/wp-content/uploads/2012/07/pkg12bro-KW.pdf