



Moore's Law: How far and how fast will it go below 90nm?

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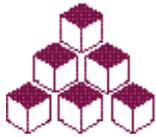
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Executive Overview

The semiconductor industry is one of the few businesses where its products continually get cheaper and better at a fast pace, and also the industry has enjoyed a fast pace of growth at the same time. That growth is characterized by what we call "growth-cyclical" in that it never grows steadily – always surging and pulling back on its way upwards. Two major factors affect this cyclicality. One is the industry's own over-enthusiasm that leads to periods of over-supply, followed by periods of under-supply. The other is the global economic cycles, which exert an over-riding effect on spending power for the produced goods that contain semiconductors. This is a classic example of an elastic market, where significantly lowering prices has the effect of opening up new applications and growing the market above where it would have been otherwise. Few markets are truly "elastic" like this.

This aggressive cost reduction is achieved through rapid technology progression. Gordon Moore of Intel in 1965 characterized this technology progression as delivering twice as many transistors per given silicon area every couple of years. This premise has continued for 39 years, doubling transistor density somewhere between every 18 months and 24 months. This has only been achieved through substantial investments in R&D and capital spending. The factories that fabricate silicon chips are the most capital-intense manufacturing facilities in existence. The results of this effort have been indisputable so far.

However, now that the technology has come to this point, it now starts to approach some of the fundamental laws of physics and the question is often raised... "How long can Moore's Law continue?"

In this report, we look at the technology roadmap and some of the basic elements that could impact its progress in the medium term. We conclude that as we now enter the era of full production at the 90nm node of silicon technology, there is very high confidence that the next two nodes of 65nm, and 45nm are achievable over the next 5 – 6 years, and the following two nodes at 32nm and 22nm have a reasonable probability of success when the top technologists apply their usual outstanding levels of ingenuity and creativity.

Beyond that... who knows whether it will be possible, or whether it will be economically viable?

From an investment perspective, there is plenty of time before we need to worry.