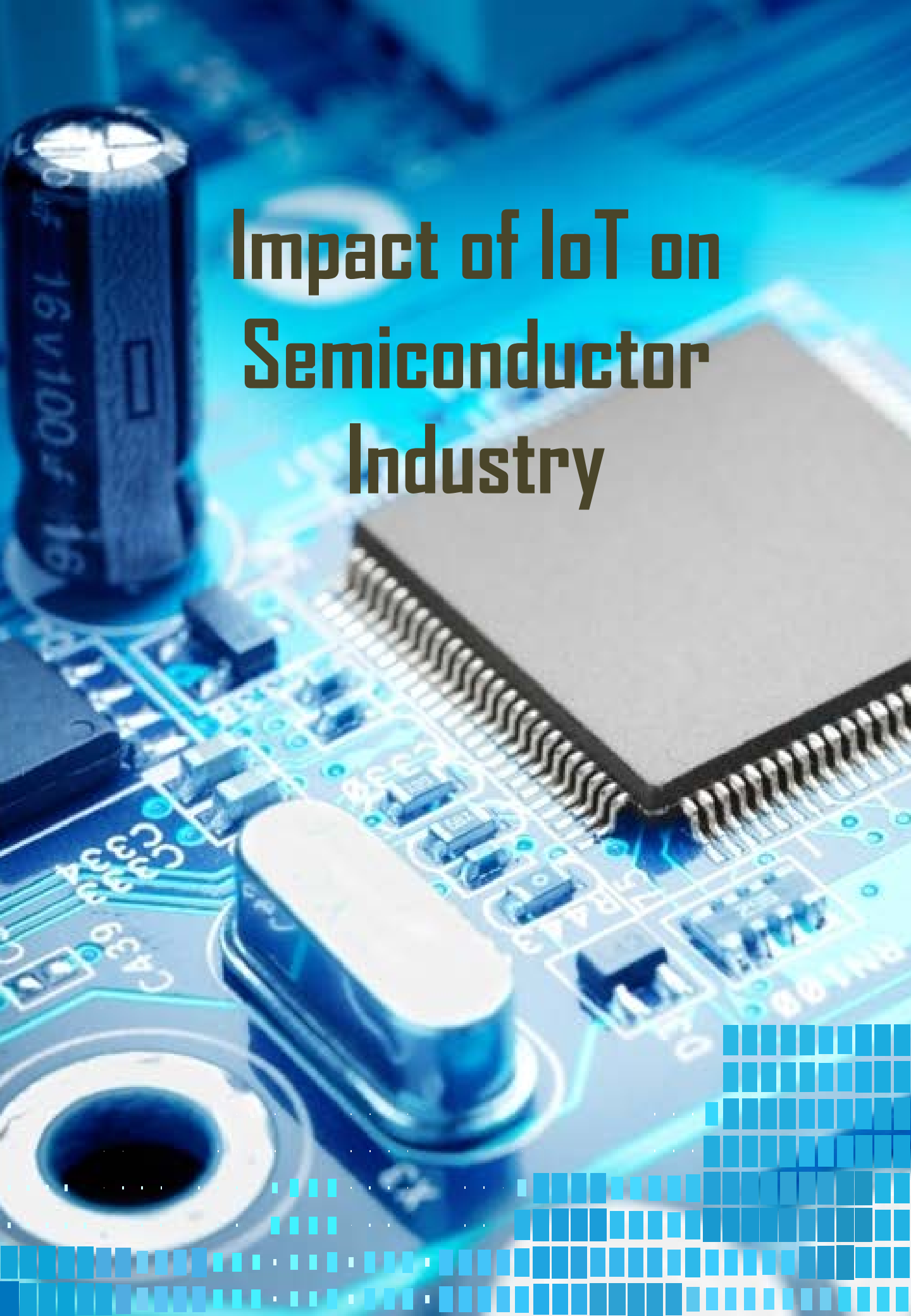


Impact of IoT on Semiconductor Industry

Current state of semiconductor Industry

The ever increasing array of electronic devices like Smartphone, tablets, cameras, aircrafts and wearable devices are constantly expanding our usage of semiconductor components in everyday life. In 2013, the global semiconductor industry saw unprecedented growth in sales, exceeding US$300 billion for the first time in history.

Industrial and automotive markets are still driving growth in the industry, with emphasis on integrating more semiconductor features on a single chip. In terms of installed components, ICs will continue to be the largest segment until 2019 with a total of US$113 billion revenues in 2019, followed by memory at US$103 billion and microcontrollers and microprocessors at US$78 billion. However, the highest growth rate will be seen in the sensors and actuators segment with a compound annual growth rate of 10.4%.

According to Gartner Inc., worldwide semiconductor revenue was expected to reach $348 billion in 2015, which is an increase of 2.2 percent from 2014. This estimate is down from the previous quarter's forecast of 4% growth.

Sensors, memory technologies and optoelectronics being key growth drivers of the industry, a decline in Smartphone sales at a growth rate of 11.3 per cent in 2015, as compared to 27.6 per cent in 2014 had resulted in a lower semiconductor growth forecast for 2015 as compared to the previous quarter. For the first time, China's Smartphone growth forecast of 2.5% in 2015 was slower than the global market. Android Smartphone growth also clocked in lower growth rate than the worldwide market, at 8.5% until 2019. The traditional PC segment will suffer the greatest decline, with production units languishing at 8.7% in 2015, lower than the forecast of the previous quarter.

At the start of 2015, semiconductor industry analysts pegged growth at 5 to 8 percent, which was later revised to 0 to 3 percent, taking into account factors like slower than previously predicted GDP globally, decrease in PC sales, lowering of the cost of DRAMs, and volatile global currency situation all being factors leading to less than expected growth estimate. Exchange rates for weakened currencies caused semiconductor companies to re-assess their strategy and bring in reductions in their original plans for capital expenditure. Average revenue growth has been steady at 3-4% annually over the past decade and the trend continues through 2016. WTS industry forecast projects steady growth at 3.4 percent globally with $358.9 billion in 2016, and 3 percent growth for 2017, with $369.6 billion.
Integrated medical equipment, computer applications, booming IoT industry and communication are expected to contribute to growth in semiconductor industry over the next few years.

Potential of IoT

The Internet Of Things (IoT) has inspired a surge of innovation and enthusiasm by blending physical and digital realms, resulting in many start-ups and established businesses putting their money on the industry's growth. A potential impact of $11.1 trillion per year in 2025 across different sectors like automobiles, logistics, smart homes and factories, public health and transportation, retail and offices has been envisaged by Mckinsey in 2015.

Digitizing the physical world will not only create tremendous economic value for pure consumer applications like smart homes, autonomous cars and so on, but also for business-to-business (B2B) applications which can generate almost 70 percent of potential value enabled by IoT.

At the heart of the IoT, lies sensor and MEMS technology. Sensors and actuators can monitor actions of connected objects and machines. Microcontrollers (MCUs) and microprocessors (MPUs) will be required to process the resulting data in the field. Connectivity chips and other RF devices will be used to transmit the data to collection points. In turn, data accumulated from the connected devices will be then subjected to processing and analysing, which will in turn generate need for greater computing and storage capacity.

Also, the demand for sensor based IoT applications will bring in an era of low-power semiconductors or a new generation of hardware systems like lower-power mesh networks. Semiconductor manufacturers with specialization in low-power chipsets, sensors and hardware components for communication will be crucial in developing unique technology and creating comprehensive solutions for sustainable value propositions.

Potential impact of IoT on semiconductor industry

While the IoT is still in nascent stages of growth, an estimated nine billion connected devices are existing today. This number is expected to increase exponentially, with industrial experts pegging estimates at 25-50 billion devices in 2025. In an interview by Mckinsey, GSA members stated that the Internet of Things would lead to semiconductor revenues being boosted due to increased demand for electronic components like microcontrollers, sensors, and memory devices.

The Internet of Things represents a growth opportunity for networks and servers, which will require cloud connectivity. The Internet of Things could help mitigate effects of slowing smartphone market and surpass the average global semiconductor growth of 3 to 4 percent as witnessed over the last decade.

GSA members however, questioned whether the IoT will lead to demand for specialised products and services catering to IoT, as opposed to a need for increased volume of existing electronic components like integrated circuits. The interview also revealed the ambiguity among industry insiders about the market potential of IoT, with 48 percent stating that it would be among the top three factors contributing to growth in the semiconductor industry while only 17% stated that it would be the number one growth inducing factor.

However, as the IoT market matures, semiconductor companies need to aggressively pursue verticals and applications showing greatest promise and assess their market potential for significant investment in the near future.

Following are the most promising verticals for semiconductor companies aiming to tap into the IoT market:

Wearable devices

According to International Data Corporation, sales of wearable computers, including smart watches, fitness trackers, healthcare assessment devices and smart glasses will jump to 111.9 million units by 2018. Designers of lower end wearable computing systems bank on multiple discrete ICs which inevitably drive up cost, power, and increase device footprint.
To maximize battery life, designers need silicon devices that offer an optimized trade-off between performance and power usage. Semiconductor companies can offer system-on-chip (SoC) or ASSP solutions customized to suit specifications for the wearable market. Development of a new breed of ultra-compact semiconductor devices will transform wearables industry into a high profit electronics market.

Potential impact of IoT on semiconductor industry

Smart-home applications

Strong growth is forecasted for the smart home market in the next five years. Technology for smart homes is fairly advanced in comparison with the wearable device industry, but standards governing interoperability have limited their adoption in a mainstream way.

Smart Home solutions can connect to the home sensor network through Zigbee technology. Over the next few years, industry observers expect over a 100 wireless connected devices in each home including sensors, gateways and remote control in the home environment. GreenPeak, a low power RF semiconductor company shipped 100 million IEEE 802.15.4/ZigBee chips in 2015 for the smart home segment.

Amazon also forayed into the smart home market by selling branded semiconductors to designers working on IoT devices, WiFi routers and other smart appliances targeted to the home segment.

Medical electronics

The advent of connected digital medical devices is leading to a gradual shift in the healthcare services from a clinical setting to the home environment. Consumers can manage their health through fitness bands and flexible patches which can monitor body parameters like heart rate and temperature. The data produced by these devices can be used by healthcare organizations to monitor patient welfare in real time. Medical devices in the IoT realm will add to capital investment in healthcare resulting in increasing need for industrial applications of semiconductors. The emergence of IoT and cloud computing software will bring in increased levels of machine-to-machine communication and increased number of digital terminals connected to the web. These factors will be key in driving growth in semiconductor industry.

Connected cars

Self-driving cars have captured popular imagination and are one of the most fascinating and futuristic applications of IoT. Sensor based systems to manage traffic flow and adjust commuting schedules based on actual data tracking of transit systems has great economic and infrastructural possibilities.

Potential impact of IoT on semiconductor industry

Industrial automation

Industries are starting to explore and implement IoT and automation technology with concepts like M2M communication, Internet of Everything, IoT, IP and Edge gaining traction in the last few years. Automation making use of IoT helps to simplify processes, enabling hardware and software architectures to be more collapsible and streamlined. These solutions are affordable and responsive, enabling seamless communication and interaction between various points from manufacturing to distribution. Sensing and actuating components in tandem with image processing mechanism such as video, robotics and so on are work together to enable better manufacturing performance and industrial flexibility. Development in industrial sector empowered by IoT will see an introduction of smart factories powered and secured by smart semiconductor solutions, which will share information across verticals for optimizing processes across the value chain from manufacturing to reaching the end user.

Smart cities

Smart cities will use nearly 1.6 Billion connected devices by 2016, which is an increase of over 39% from the previous year.

Commercial real estate will benefit from a unified view to manage facilities as well as through advanced analytics via data collection enabled from a sensor or mesh network. The smart grid, comprising modern power distribution and feedback systems to automate processes and monitor progress remotely have self-healing designs will facilitate reliable, integration of renewable resources.

This bodes well for the semiconductor industry, which will supply much of the intelligence and control for the proliferation of smart grids.

MCUs, CPUs, FPGAs, DSPs, and CPLDs, will enable appreciable levels of communications, automation, and artificial intelligence to be implemented in power distribution systems which will contribute to the development of smart grids and smart cities.

Challenges

The IoT is not as simple as connecting devices together and storing information in the cloud, the real challenge lies in gathering insights by combining sensor information with big data analytics. Following are some of the challenges that could derail the growth and large scale implementation of IoT

Niche appeal – One of the greatest obstacles to IoT proliferation are the products within its market, which predominantly cater to a niche customer base, generating low sales volumes, and an environment which is not favourable for creating ASIC chips. Semiconductor companies have limited their expenditure on IoT specific chips, preferring to adapt existing products to meet IoT demand instead.

Security and privacy – The general agreement of industry experts is that absolute, uncompromising security is impossible, and as large volumes of sensitive data is transferred over the IoT, risk of data and identity theft, manipulation of connected devices, falsification of data, network breach and IP theft becomes greater. The entire IoT stack of cloud, servers, and devices need to be protected rather than focusing on fortification of only one of these areas.

IoT Standards – Some layers of the IoT technology stack do not have standards while others have various conflicting standards which complicates product development and industry growth. There are competing, incompatible connectivity standards for devices with low and medium range data—for instance, Bluetooth, LTE Category 0, and ZigBee. Product designers and end users are reluctant to develop and buy devices that may not be interoperable with existing and future standards.

Fragmented marketplace for different specifications of chips – IoT devices have widely varying requirements for device specifications depending on applications, e.g. a smart water meter needs to run for months, if not years, independent on power supply, and can function at low data rates. IoT devices for industrial automation require continuous power supply and high data processing capabilities. These variations in device specifications become significant considering costs for developing a single chip.

Difficulty in value extraction as compared to software and cloud players – Value extraction remains a concern for semiconductor companies as big data and cloud companies are better positioned to capture a large portion of the IoT market as compared to semiconductor businesses.

What can semiconductor players do to meet these challenges?

Semiconductor players are moving full steam to address these challenges. Some of the areas where semiconductor companies can spearhead their IoT campaign are by using the following strategies:

Finding profitable IoT niches suited to your competencies – There are many upcoming niches within the fragmented IoT market which semiconductor providers need to take note of. The most profitable segments similar to their current portfolio and falling within range of their future capabilities would be the choice most likely to be a winner. Semiconductor players with strong interests in consumer-electronics companies can place their bet on wearables and smart-home devices. They can develop silicon, software, algorithms, hardware designs, and associated network infrastructure. On the other hand, a company with expertise in ICs and security solutions might be well suited to provide IoT services for medical applications.

Simple one-stop solutions for IoT devices including customer support – Start-ups and non-technical businesses which will stimulate customer demand and create innovative IoT applications have limited experience with semiconductors, paving the way for a newly raised demand for simple solutions and hands-on support for board-level design and solution integration. One-stop solutions and complete platforms for IoT devices including sensors, microprocessors, storage devices, connectivity and software may be a lucrative solution that could be provided by semiconductor companies.

On-chip security and comprehensive security solutions – Semiconductor companies can provide on-chip security or partition processor functions at the chip level. They can supply complete hardware and software services by undertaking M&A or forming partnerships with players to gain expertise in software or cloud security.

Adopting a standard most likely to be prevalent in future, while still being flexible to embrace alternatives – Though initial efforts have been made to bring in standardisation, it is difficult to predict which will prevail over time in each IoT vertical. Semiconductor players should follow a hedging strategy, focusing on standards that are likely to be widely adopted while simultaneously preparing for alternative scenarios. Semiconductor players should engage with industry associations and groups influential in selecting the best standards.

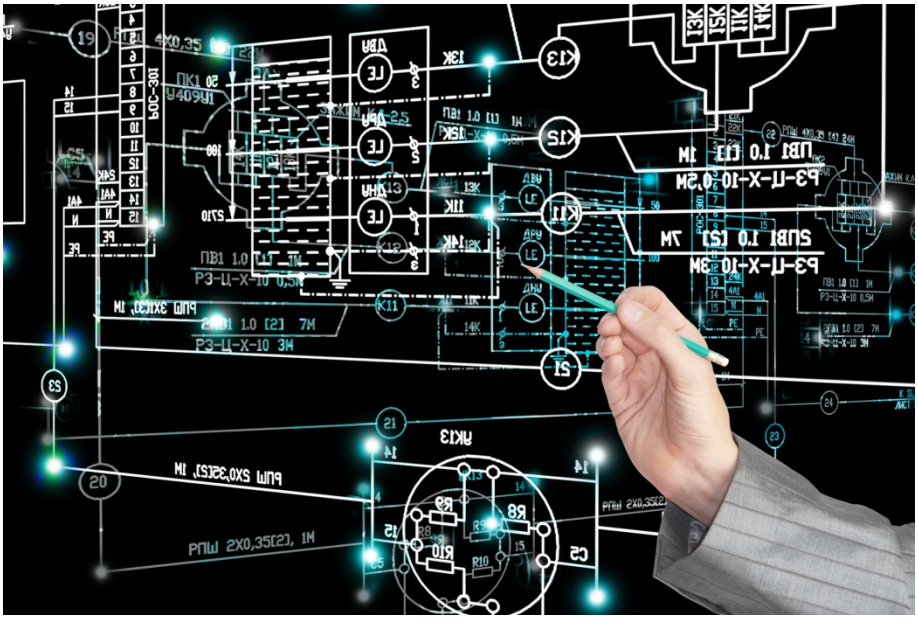
What can semiconductor players do to meet these challenges?

Creating a single platform by classifying devices into archetypes based on their specifications – Variations in device specifications can be addressed by classification of devices into archetypes depending on their specifications, and then developing a single platform to cover each type. Products from multiple verticals can be classified as one archetype if they have similar specifications. Semiconductor companies can create a common platform for low-cost applications which have common specifications like short-range, lower data rate and limited data processing.

Comprehensive solutions for integrated solutions – Semiconductor companies could provide comprehensive solutions combining security, software, systems- integration services in addition to hardware solutions. With this move, semiconductor companies could transform from component suppliers to solution providers, and be in a stronger position on the IoT pyramid.

A more appropriate organizational structure and sales approach for the Internet of Things – Emphasizing on a sales approach catering to different markets and focusing on channel partners, such as distributors should be the go-to sales strategy. This strategy is well-suited for the fragmented IoT market and the different players forming the unconventional ecosystem.

Investing in diverse markets – A limited number of large portfolio bets should be avoided, focusing on investigating diverse applications across different IoT verticals instead.



Conclusion and outlook

The Internet of Things has the ability to change society as a whole, though the exact form that this change will take is still uncertain. The semiconductor sector will play a major role in its adoption, and stands to grow exponentially, though not at the 10-15% growth witnessed in the 80s.

Semiconductor executives should look into integrating upcoming development models and go-to-market strategies in their existing operations in order to overcome challenges in the IoT market.

Semiconductor companies which manage to look beyond Silicon to provide comprehensive solutions covering multiple layers of the IoT stack through system and application level integration will emerge as likely winners in the long run.