Testimony of the
Semiconductor Industry Association (SIA)
Before the
Senate Committee on Economic Development, Housing and General Affairs
On
Bill S.239

March 12, 2014

The Semiconductor Industry Association (SIA), the voice of the U.S. semiconductor industry,[1] appreciates the opportunity to submit this testimony on S.239.

Semiconductors are the integrated circuits (commonly called ICs or "chips") that are the enabling technology for all modern electronics found in computers and cell phones, cars and health care devices, communications and military systems, and all other facets of modern technology. Because semiconductors are a foundational technology for virtually all areas of our economy, continued U.S. leadership in semiconductor technology is essential to America's continued global economic leadership. Semiconductors are one of the nation's top exports[2] and the industry directly employs about 250,000 employees and results in approximately 1.1 million indirect jobs.

The U.S. semiconductor industry shares the objectives of S.239: to achieve a high level of protection of human health and the environment by minimizing risks potentially posed by exposure to hazardous chemicals. However, we believe that the approach taken in S.239 is not an effective way of achieving these shared goals. Our primary concerns relate to the following:

- The bill is not harmonized with international and U.S. chemicals regulations and industry standards.
- The bill employs a purely hazard-based approach rather than a risk-based approach.
- The bill does not include a de minimis or threshold level of a chemical of concern.
- Various provisions in the bill are unnecessarily burdensome and will not be workable for the U.S. semiconductor industry and the wide variety of products that contain semiconductors.
- The bill needs to specifically protect proprietary information.
- The bill needs to ensure that manufacturers have adequate time to respond to any regulatory action taken on a chemical of concern.

[1] SIA seeks to strengthen U.S. leadership of semiconductor design and manufacturing by working with the federal, and state governments and other key stakeholders by encouraging policies and regulations that fuel innovation, propel business and drive international competition in order to maintain a thriving semiconductor industry in the United States. Additional information on SIA is available at www.semiconductors.org.

[2] During the period 2008-12, semiconductors were the second largest export from the U.S., after aircraft. *Source: U.S. International Trade Commission. Industry Defined By: NAIC Codes 336411 (Aircraft); 334413 (Semiconductors); 336111 (Automobiles); 324110 (Petroleum Refinery Products), Based from total exports revenue.*

As a result, we fear that the bill might unnecessarily restrict the availability of technology goods reliant on semiconductors in Vermont. We look forward to working with the legislature to modify S.239 to make the bill workable in achieving our shared environmental and health goals.

Overview on the Use of Chemicals in the Semiconductor Industry

The manufacture of advanced semiconductors is dependent on advancements in chemicals and materials science, and the responsible use of chemicals is essential to maintain the growth and competitiveness of the U.S. semiconductor industry. Accordingly, sound policy governing the regulation of chemicals and materials is a top priority for the industry.

In order to safeguard the environment, the industry has been a leader in phasing out substances of concern[3] and reducing the already low levels of emissions from our manufacturing facilities.[4] In addition, finished semiconductor products do not result in exposure to consumers or the public at large to the chemicals or materials present in the product. Semiconductors are very small components that are embedded in a wide range of common electronic products. Any chemicals contained in a semiconductor product are present only in extremely small quantities, and these chemicals are not released to the environment or result in exposure to the consumer. The chemicals that may be found in a finished semiconductor are bound to the device in a monolithic fashion and cannot be separated from the device. These devices are then embedded into an assembly sold to the consumer as part of a larger electronic product.

[3] The semiconductor industry has a long history of leadership of substituting chemicals of concern with more benign substances. For example, the industry replaced the use of chlorinated solvents with rubbing alcohol, phased-out glycol ethers with propelyne, and was one of the first industries to eliminate the use of ozone depleting substances (ODSs). More recently, in response to concerns of the environmental and health community associated with the use of perfluorooctanyl sulfonates (PFOS), the semiconductor industry has eliminated the use of PFOS in most applications and emissions have been reduced by 99 percent since 2005. See World Semiconductor Council (2011 Joint Statement) available at: http://www.semiconductorcouncil.org/wsc/uploads/WSC_2011_Joint_Statement.pdf.

[4] According to data in the Toxics Release Inventory (TRI), the entire sector within the Computers/Electronics Products category (334) contributes just 0.1 percent of the total of TRI releases for all industries. The TRI emissions for this sector amounts to 4.459 million pounds out of a total of over 4 billion pounds from all industries, and the semiconductor industry (NAICS code 334413) is just one subset of this larger sector. See http://www.epa.gov/tri/tridata/tri10/nationalanalysis/index.htm. In terms of greenhouse gas emissions, the semiconductor industry contributes 0.08 percent of total emissions in the U.S. EPA data show that out of 6.7 billion metric tons of CO_2-equivalents emitted in the entire US, only 5.4 million metric tons is emitted by the industry. http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2013-Main-Text.pdf. The global industry has an ongoing voluntary program to further reduce its emissions of a group of greenhouse gases known as perfluorinated compounds (PFCs). See World Semiconductor Council (2011 Joint Statement) available at: http://www.semiconductorcouncil.org/wsc/uploads/WSC_2011_Joint_Statement.pdf.

SIA Concerns with S.239

Our primary concerns with the bill relate to the following issues.

1. Absence of Harmonization

For chemicals in products that are distributed in interstate and international commerce, it is imperative that national and state laws governing the product content are harmonized to the greatest extent possible. We acknowledge the interest of Vermont in establishing high standards for the protection of human health and the environment, but we believe that the state should consider the potential for state-specific product requirements to create a burdensome "patchwork" of requirements that are difficult – or even impossible – to comply with in terms of products intended for global distribution. This is particularly true in the case of semiconductors, where the finished product is embedded in a larger product sold globally and where there is little risk of exposure to the small quantities of chemicals contained in the product.

To the extent possible, Vermont should draw on the "lessons learned" in other jurisdictions and build upon their experience, data and expertise. We note that section 1773(c) states that the Commissioner of Health "may consider designations made by other states, the federal government, other countries, or other governmental agencies." We agree with this provision, and we urge the bill to be modified so that it leverages the regulatory approaches already in existence at the international and federal level, as well as in other states, and also consider approaches employed in voluntary industry standards.

For example, while several states have enacted laws that establish a method for identifying chemicals of concern based on various hazard factors, similar to S.239, these other states have typically adopted a more focused approach than the Vermont bill. Laws in states such as Maine, Massachusetts, Minnesota, and Washington have focused on the presence of those chemicals in products intended primarily for use by sensitive subpopulations, such as children's products. Other states, such as Alaska and Connecticut, are considering similar legislation focused on children's products. California's law is broader than children's products, but this law includes a separate process for listing "priority products" that contain chemicals of concern. In contrast, the Vermont bill covers any product containing a priority chemical at any detectible level.

Similarly, Vermont and other states have adopted laws focused on specific chemicals of concern. For example, Vermont and other states have banned the use of Bisphenol A (BPA) in children's products, lead used in toys or other articles used by children, and other chemicals that are known to present a high risk of adverse impacts to human health and the environment. Once again, these laws are narrow and targeted and avoid the implementation and other problems inherent in S.239.

Section 1775(f) imposes a fee on manufacturers for each chemical of concern present in a product. We are not aware of other state laws that impose a similar fee. Once

again, we urge Vermont to revise the bill to make it more harmonized with the approaches of other states.

We believe that a more narrowly tailored approach that is consistent with the laws of other states would be more effective and would achieve the state's goals in a more efficient, workable manner.

2. Lack of a Risk-Based Approach

The bill defines "Chemicals of concern" on the basis of several hazard traits, and the presence of a specified chemical – at any detectible level – triggers regulatory requirements, including potential bans. These actions are imposed without regard to whether the chemical may be released to the environment or whether humans would be exposed to the chemical as used in the product. This hazard-based approach should be replaced with a risk-based approach that takes into account the availability of the chemical in a particular product.

As stated above, the chemicals that may be contained in a finished semiconductor will not be released to the environment or result in exposure to consumers. Finished semiconductor products are small – most semiconductors weigh no more than a few grams and are about 2 cm squared in size or smaller. The chemicals that may be detected on a semiconductor are found in extremely small volumes as deposits of ultra-thin films and etched or formed into the layers and sections of the metals, organic-metallic complexes, organics and other materials in the semiconductor product. These materials are bound to the device in a monolithic fashion, cannot be separated from the device, and are not released to the environment without taking extreme and unusual destructive measures.

In other jurisdictions that have employed a hazard-based approach, manuacturers have been required to make significant expenditures in compliance with little or no corresponding benefit to health or the environment. For example, a decade ago the European Union adopted a directive that included, among other things, a ban on lead solder, a basic building block of the electronics industry for decades.[5] Despite the lack of evidence of risks from lead solder in electronic products[6] – as opposed to the known risks associated with lead in other applications (e.g., gasoline, paint, etc.) – semiconductor manufacturers and others in the global electronics supply chain were forced to make a costly shift from lead solder to other alternatives. Fortunately, the semiconductor industry was given enough time to implement this complex and costly transition, and the EU properly provided certain critical exemptions when substitutes for lead solder were unavailable. But this example illustrates the problems inherent in a hazard-based approach.

[5] Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive (2002/95/EC).

[6] Indeed, a study funded by EPA's Design for the Environment Program conducted a life cycle assessment of lead solder and various alternatives, and concluded that various available alternatives did not benefit the environment as compared with lead solder. "Solders in Electronics: A Life Cycle Assessment Summary" (EPA-744-S-05-001 August 2005).

Accordingly, we recommend that the bill be modified to focus on chemicals that are intended to be released from a product, or are likely to result in exposure to humans and the environment. This type of risk-based approach will avoid the needless reporting of extremely small quantities of chemicals embedded in products that are not likely to result in any risk to human health and the environment.

3. Absence of a Threshold Level

A major challenge with the bill as currently drafted is the absence of a *de minimis* or threshold level for triggering regulation. Instead, the bill bases regulation on any detectible level of the presence of the chemical, referred to in the bill as a "practical quantification limit (PQL)." Given that detection levels are becoming increasingly sophisticated and laboratories can now detect chemicals in the parts per billion or even parts per trillion, basing regulation on "the lowest concentration that can be reliably measured within specified limits of precision, accuracy, representativeness, completeness, and comparability during routine laboratory operating conditions" means that the presence of a chemical at virtually any level will give rise to regulation. This approach makes little sense in protecting human health and the environment in a meaningful manner, and creates the potential for noncompliance any time there is an improvement in testing capability.

Other chemical regulations in the U.S. and around the world establish a *de minimis* or threshold level as a means of making the system workable and focusing effort on the presence of chemicals in quantities that may give rise to health or environmental concerns. For example, the landmark REACH Directive of the European Union specifies a 1000 ppm or 0.1 percent threshold for the regulation of a chemical in terms of the weight of the final article. Similarly, in the EU Restriction on Hazardous Substances (RoHS) Directive, the maximum permitted concentrations of the restricted substances is generally 0.1 percent or 1000 ppm by weight. We note that Section 1775(a)(2) of the bill establishes a de minimis level of 100 parts per million for a chemical of high concern to be present in a consumer product as a contaminant, but this provision applies only to contaminants and not as a general threshold level for chemicals of concern in products.

The global electronics industry has also devised voluntary industry standards, such as the Joint Industry Guide – JIG (2007): Material Composition Declaration for Electronic Products; JIG-101 A, that includes relevant thresholds. This guide sets forth the materials and substances and reporting thresholds that should be disclosed by suppliers when those substances are present in products incorporated into electronic products. This guide has served well both the public and the global industry, and we believe that reporting requirements in S.239 should strive to be consistent with the requirements set forth in this guide.

4. Burden and Workability

Other aspects of the bill will make it burdensome to implement as a practical manner. For example, the definition of "Consumer Product" is overly broad and fails to differentiate among products that are likely to result in exposure to a chemical of concern – such as semiconductors and electronics more generally – that will not result in exposure to the chemical. We believe that the bill should be revised to focus on common household and consumer products where there is a release of a chemical of concern as an intentional or foreseeable use (or even misuse) of the product.

5. Protection of Confidential Business Information

The protection of confidential business information (CBI) is critical to the U.S. semiconductor industry. The semiconductor industry is research intensive. SIA member companies invest, on average, 18 percent of revenues to research and development – one of the highest percentages of revenue of any industry. In 2012, this amounted to approximately $32 billion in research and development. Nearly half of the top 15 American patent recipients are semiconductor companies. The continued success of our industry and continued American leadership in semiconductor design and manufacturing depends on the protection of intellectual property from disclosure.

Section 1775 (d) of the bill states that information submitted to the State on the presence of chemicals in products is exempt from copying and inspection under other provisions of state law, subject to certain exemptions. While we appreciate this acknowledgement of the need to protect CBI, the bill should be modified to include more specific protections for CBI upon request by the product manufacturer. The presence of certain chemicals in a product may be highly proprietary, and therefore additional safeguards are needed to protect CBI.

6. Adequate Timelines for Action

Section 1776 authorizes the Commissioner to take action to prohibit the sale of products containing certain chemicals or to require the labeling of these products. The bill must ensure that manufacturers have sufficient time to make any changes resulting from regulatory action.

The semiconductor industry utilizes chemicals with unique chemical and physical properties that help make possible the production of advanced semiconductors – devices that may contain over a billion transistors on a single chip, at a feature size of 22-nanometer (i.e., 22 billionths of a meter, or roughly a 4,000th the width of a human hair).[7] Chemicals are selected based on their unique properties and functionality, and the industry's advanced manufacturing equipment is designed to operate using these specific chemicals. As a result, there are typically no "drop-in" replacements for many of the chemicals currently in use in any given manufacturing process. This makes it very challenging to replace the critical chemicals once they have been selected for the manufacturing process. As stated above, in the case of the EU RoHS Directive, the

[7] "Moore's Law: The rule that really matters in tech (Oct. 15, 2012) (available at http://news.cnet.com/8301-11386_3-57526581-76/moores-law-the-rule-that-really-matters-in-tech/).

industry required a decade of re-tooling (as well as certain critical use exemptions). Similarly, the 10-year effort to phase-out the use of PFOS by the industry continues. Accordingly, in the event that a chemical in our industry is selected for regulatory action, it is essential that the legislation provide for sufficient time to make the necessary changes.

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We look forward to working with the Vermont legislature to develop a more workable system of chemicals regulation to protect the environment and health of citizens in Vermont.

Thank you for the opportunity to submit this testimony on behalf of the U.S. semiconductor industry. For more information, please contact David Isaacs at disaacs@semiconductors.org