Semiconductor Chips Protection Act

Submitted By

Varun Kumar Singh (vsingh30)

Rights in Digital Age

EN 650.614

Table of Contents

ABSTRACT

In absence of enough provisions in Traditional copyright law to protect semiconductor chips, the Semiconductor Chip Protection Act ("SCPA") was passed by U.S. Congress in the year of 1984 to provide protection against piracy and duplication of chips to U.S. chip manufacturers. In this paper, the author evaluates the SCPA's reason of origination, it's impact and efficacy. Further, the author shed light on how SCPA differs from traditional copyright along with how historically such cases were dealt with before SCPA. The author then draws comparisons between international chip protection acts with SCPA making an argument that the global decline in chip piracy is mostly due to reasons other than foreign chip laws and concluding that the fast-paced changes in technology and market have rendered such protection laws insignificant. Finally, the author draws a close by discussing some new laws and acts like the CHIPS for America Act and FABS act.

INDEX TERMS

Mask designs, International law, Intellectual property law

I. INTRODUCTION

Most people come across multiple devices in a day containing semiconductors and chips without even realizing it. From high end technologically advanced devices like Blu-ray players, laptops, mobile phones to simple devices like alarm clocks, toasters, lamps all consist of integrated circuits or chips. With technological advancements such chips consisting of only a few thousand transistors have grown to millions of them in smaller units, but we are getting ahead of the picture.

Treading back to the early 1970s, there was a sharp rise of chip pirates who manufactured copies of these semiconductor chips at an extraordinary pace without the expensive research and

development process by simply copying the “masked works” or “masked designs” to sell them at reduced costs. This infringement posed a challenge as it could not be incorporated in the domain of patent law as the pirated designs were not protectable inventions but designs that were etched on the chips of patented devices. Further the designs could not be incorporated into traditional copyright law either as copyright law only protects an original work of authorship if the work is non-functional but, in this case, they were functional and not aesthetic. Finally trade secrets couldn’t protect it either as once the design was introduced to the public, it forgoes the protection. Therefore, a new IP protection framework was needed.

In 1984, Congress enacted the Semiconductor Chip Protection Act (“SCPA”) which created a new type of intellectual property right (17 USC §900). This new IP right was available for semiconductor chip manufacturers and covered “mask works.”

II. LITERATURE REVIEW

The SCPA shares similarity with both patent and copyright law but is neither of them but rather, it is a hybrid form of intellectual property law combining elements of both patent and copyright along with its own set of novel ideas.

A. *Semiconductor protection act*

§ 901 Definitions

(1) a “semiconductor chip product” is the last or intermediate form of any product—

(A) having more than one layer of metallic, insulating or semiconductor material, deposited or placed or etched away in accordance with a predetermined pattern; and

(B) Intended to perform electronic circuitry functions.

(2) a “mask work” is a series of related images, however fixed or encoded—

(A) A mask work that has or represents a predetermined, three-dimensional pattern of metallic, insulating, or semiconductor material present or removed from the layers of a semiconductor chip product is one that displays the specific arrangement and configuration of these materials on or within the chip product. This pattern may be used to create functional components or features on the chip, and the mask works as a blueprint or guide to produce the chip. The mask work therefore represents the specific design of the chip product, including the placement and distribution of the various materials within it.

(B) In a series of images, the relationship between the images is such that each image displays the pattern of the surface of a different form of the semiconductor chip product. Each image in the series therefore corresponds to a different version or variation of the chip product, and the series provides a visual representation of the various forms that the product can take.

(3) A mask work is considered "fixed" in a semiconductor chip product when it is embedded in the product in a way that allows it to be perceived or reproduced for more than a fleeting amount of time. This means that the embodiment of the mask work in the product must be stable and permanent enough to be accessed and used for a significant period. [1]

(a)(1) Subject to the provisions of subsection

(b) A mask work fixed in a semiconductor chip product is eligible for protection under the law governing mask works if it was created by the owner of the mask work or by someone authorized by the owner if—

(A) Under section 908, the date on which the mask work is registered or first commercially exploited anywhere in the world, whichever occurs first, marks the date when the owner of the

mask work is determined. (i) a national or domiciliary of the United States, (ii) a national, domiciliary, or sovereign authority of a foreign nation that is a party to a treaty affording protection to mask works to which the United States is also a party, or (iii) a stateless person, wherever that person may be domiciled.

(B) the mask work is first commercially exploited in the United States; or

(C) the mask work comes within the scope of a Presidential proclamation.

(b) Under this chapter, protection is not available for a mask work that

(1) is not original or

(2) consists of designs that are commonly used, ordinary, or familiar in the semiconductor industry, or variations of such designs, when combined in a way that, as a whole, is not original.

(c) Protection under this chapter for a mask work does not extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of how it is described, explained, illustrated, or embodied in the work. [1]

§ 904 Duration of protection

(a) The protection for a mask work under this chapter begins on the date of its registration under section 908 or the date it is first commercially exploited anywhere in the world, whichever comes first.

(b) Subject to subsection (c), the protection provided under this chapter for a mask work will end 10 years after the date on which the protection begins under subsection (a).

(c) However, the terms of protection provided in this section will extend until the end of the calendar year in which they would have otherwise expired.

§ 905 Exclusive rights in mask works

As the owner of a mask work, the individual is granted exclusive rights to do and authorize any of the following actions under this chapter:

(1) To reproduce the mask work by any means, including optical, electronic, or any other method;

(2) To import or distribute a semiconductor chip product that incorporates the mask work.

(3) To induce or knowingly cause another person to perform any of the actions described in paragraphs (1) and (2).

§ 906 Limitation on exclusive rights: reverse engineering

(a) Notwithstanding the provisions of section 905, it is not an infringement of the exclusive rights of the owner of a mask work for—

(1) a person to reproduce the mask work solely for the purpose of teaching, analyzing, or evaluating the concepts or techniques embodied in the mask work or the circuitry, logic flow, or organization of components used in the mask work; or

(2) a person who performs the analysis or evaluation described in paragraph (1) to incorporate the results of such conduct in an original mask work which is made to be distributed.

(b) Notwithstanding the provisions of section 905(2), the owner of a particular semiconductor chip product made by the owner of the mask work, or by any person authorized by the owner of the mask work, may import, distribute, or otherwise dispose of or use, but not reproduce, that particular semiconductor chip product without the authority of the owner of the mask work.

III. SIGNIFICANT CASES

To understand the limitations and protections offered by semiconductor chip protection law, we review significant cases in the domain.

Brooktree Corp. v. Advanced Micro Devices, Inc., 705 F. Supp. 491,494 (S.D. Cal. 1988)

Introduction: Brooktree claims that it invested around $3.8 million in developing chips for converting digital graphics to analog at high frequencies for high resolution computer video screens. It also claims that its chip has taken over the market previously dominated by AMD.

Claim: Brooktree claims that AMD has released copies of two of its chips, called "pirated chips," at lower prices in an attempt to regain the market it lost. These pirated chips are allegedly copies of two of Brooktree's chips. Further, Brooktree is alleging that AMD has released pirated copies of two of its chips, which represent 40% of Brooktree's sales, at lower prices in an attempt to regain market share. Brooktree claims that this unlawful conduct has caused irreparable harm, including over $2.75 million in damages in the last six months, lost sales, and a lost ability to expand or go public due to lost profits. Brooktree's $30 million investment since 1981 is reportedly in jeopardy because the company has only recently become profitable and does not have the financial strength to withstand the loss of sales. Brooktree also alleges that AMD's pirating is affecting its other products, as it is being forced to lower the prices of all its chips to maintain its cost structure.

Discussion: Brooktree is alleging that AMD stole the mask works for its Bt451 and Bt458 chips. The mask works in question are the location and configuration of the active areas in the Static Ram cells, and the location and path of the polysilicon lines in the Static Ram cells.

Brooktree has two main allegations against AMD. First, it claims that the mask works in AMD's chips are very similar or identical to those in Brooktree's chips. Second, it alleges that this similarity is not the result of thorough reverse engineering, but rather of simple copying.

A. Identical/Similar

The parties agree that if AMD can provide evidence of reverse engineering, the standard for comparison is substantial similarity rather than substantial identity. The court finds that AMD has provided sufficient evidence to require Brooktree to prove that the alleged pirated chip is substantially identical to the original chip.

AMD argues that while the layout of the mask works may be similar, they are not substantially identical. AMD also claims that this type of layout is the result of functional requirements, or that it is essentially the only way to lay out the Static Ram circuit. In response, Brooktree presents two alternative designs by two individuals with limited knowledge of Brooktree's layout. However, these two new layouts do not prove that there are many potential layouts, and they may actually support AMD's position that there is little room for diversity in the layout due to functional requirements.

B. Reverse Engineering Defense

AMD argues that its design was discovered through reverse engineering, which is allowed under the Mask Work Act supporting this with a paper trail showing various stages of William Plants, (the designer of AMD's chips) discovery process. Brooktree counters that the evidence shows that AMD's designer was unable to discover the design on his own, and that the design was copied from Brooktree's chip.

The court has determined that Brooktree has not convincingly shown that it is likely to succeed in its case. As a result, Brooktree must demonstrate a greater level of potential harm if its request for an injunction is to be granted.

C. Irreparable Harm

Brooktree claims that it has lost customers and profits and has been forced to cut prices. AMD argues that the harm Brooktree has suffered is monetary and can be compensated without an injunction, and that an injunction would merely prevent AMD from competing with Brooktree for new sales.

The court found that Brooktree had not yet suffered any serious loss in sales and did not grant the injunction. Further It is unclear whether Congress intended for the presumption of irreparable injury, which applies to copyright law, to also apply to infringements of mask works under the Mask Work Act. However, the court in this case did not need to consider whether such a presumption exists, as it had already found that Brooktree did not prove that AMD infringed on its mask work rights.

Decision

After considering the evidence and arguments presented by the parties, the court has decided to deny the plaintiff's request for a preliminary injunction. [2]

Inference

The court in Brooktree held that infringement under the SCPA does not require copying of all parts of the accused chip. It ruled that mask works fixed in a chip infringe a protected mask work even if the infringing mask works are only 80% similar to the protected mask work. This means that

copying only part of a chip or mask work may result in SCPA liability, contrary to the apparent legislative history of the SCPA. In reaching its decision, the Federal Circuit relied on copyright law and the SCPA's legislative history to determine if infringement had occurred, since the SCPA lacks specific provisions regarding the level of similarity required between the accused and protected mask works. Under copyright law, the accused chip was considered infringing because a material portion of the protected mask work had been appropriated, making the infringing chip and mask work substantially similar to the protected chip.

Altera v. Clear Logic (9th Cir. 2005).

Introduction: Altera is a company that manufactures programmable logic devices (PLDs), which are chips that can be programmed to perform various logic functions. Clear Logic, on the other hand, manufactures application-specific integrated circuits (ASICs), which are chips that are designed to perform one specific function and cannot be programmed by the customer.

Traditionally, a company that converts from PLDs to ASICs must go through a lengthy design process, starting from a high level of description and working towards the final product. This process can take several months and carries a significant risk that the first chip produced will not work, requiring additional time and money to be invested in refining the design.

Clear Logic operates using a different business model than Altera. When customers program Altera devices, they generate a file called a bitstream. Clear Logic asks customers to send the bitstream to them, and they use it to create an ASIC that is compatible with Altera chips. The laser process that Clear Logic uses allows for a quick turnaround time of just a few weeks and rarely produces incompatible chips.

Claim: Faced with the potential loss of millions of dollars in business, Altera has challenged Clear Logic's business model in court. In the district court, Altera claimed that Clear Logic infringed upon its rights under the SCPA by copying the layout design of its registered mask works for three families of chip products. Clear Logic denied the infringement and argued that it had reverse engineered Altera's products.

Altera has alleged state law claims based on a provision in its software licensing agreement that permits customers to use its software for the sole purpose of programming logic devices manufactured and sold by Altera or its authorized distributors. This provision was added to the agreement in 1999.

Based on the provision in its software licensing agreement, Altera has brought state law claims against Clear Logic for inducing its customers to breach their license agreements with Altera and for intentionally interfering with those contractual relations.

Discussion: Before trial, the district court partially granted Altera's motion for summary judgment on the scope of the SCPA. The court determined that Altera's chip layout design is more than just an idea and is in fact the blueprint for the layout of the semiconductor chip. The court also concluded that the SCPA is broad enough to cover the claims made by Altera but left it to the jury to decide whether Altera had proven infringement. The court relied on the case of Brooktree Corp. v. Advanced Micro Devices, Inc., the only case to date that has examined the SCPA, in explaining that copying groupings of transistors and interconnection lines may constitute a violation of the Act.

The chip design process involves a progression from abstract ideas to more concrete representations of those ideas. The customer's initial idea is at the highest level of abstraction, and

the schematics and floor plans convey more concrete ideas about how the chip may be structured or organized. These preliminary sketches would not typically be protected under traditional copyright principles. As the design process continues, the ideas become increasingly concrete and are finally expressed in the layout of the transistors in the mask work. This final layout is the physical embodiment of the design and is protected by the SCPA. It is only when the design reaches the level of the mask work, which is the part of the process that Congress chose to protect under the SCPA, that the ideas are expressed in a tangible form. The mask work is the physical embodiment of the chip design and is subject to protection under the SCPA. The district court correctly determined that the organization of the groupings of transistors and interconnection lines is physically a part of the mask work. The jury was allowed to determine whether Clear Logic's use of these groupings constituted an infringement of the SCPA.

The organization of the groupings of transistors and interconnection lines in a mask work is not an abstract concept but is instead embodied in the chip and affects its performance and efficiency. According to the Federal Circuit's ruling in Brooktree, it is the responsibility of the jury to determine whether these aspects of the mask work are material and whether the similarity between the mask works is substantial. The district court did not err in finding that the organization of these groupings and their interconnections is protected under the SCPA. The arrangement of the transistors within these blocks is also protected, but the jury must decide whether the similarities are more important than the differences.

Reverse Engineering Defense

After considering the evidence, the jury found that Clear Logic had not established a reverse engineering defense for any of the chip families at issue. As a result, the jury determined that Clear Logic had not proven that its use of Altera's mask works was protected under the SCPA.

Decision

The district court determined that the selection, combination, and arrangement of electrical components in the mask works, including the placement, orientation, and interrelationship of groupings of transistors and interconnection lines, are protectible under the SCPA. The court referred to this as the "mask work layout design" and found that it is entitled to protection under the Act ruling it in favor of Altera. [3]

IV. IMPORTANCE OF REVERSE ENGINEERING DEFENSE

The reverse engineering defense was included in the SCPA due to the longstanding practice of "second sourcing" in the semiconductor industry. Second sourcing involves a purchaser of a chip requesting two different suppliers to provide the chip. This process benefits the industry because it ensures that a needed chip can still be obtained if the primary supplier is unable or unwilling to produce it, particularly in cases of national defense.

In addition to ensuring the availability of needed chips through second sourcing, reverse engineering also promotes the advancement of the state of the art in the field of integrated circuits by allowing competitors to improve on existing designs. This allows for ongoing innovation and progress in the industry.

V. SCPA RELEVANCE IN MODERN WORLD

Even though the SCPA provided a framework to resolve disputes in the late 1980’s as seen in the above cases, the main reason for decline of chip piracy differs. The Chip Act's history suggests that the requirement of a "substantial toil and investment" was intended to address the problem of slavish (“The ability to create a functioning chip by using photographic copying of mask works without requiring additional engineering”)[5] copying of semiconductor chip designs.

However, it appears that advancements in technology and the increasing complexity of chip design have made it more difficult for competitors to engage in this type of copying. As a result, it is reasonable to question whether the SCPA remains relevant today. The answer to this question depends on whether the Act was intended to only address slavish copying, or if it was also meant to prohibit "barren copying," which occurs when a competitor copies a chip design using reverse engineering and only performs the minimum amount of forward engineering needed to produce a functional chip.

Going over some old statistics we observe that according to a 2012 study, there were only a little over 1,000 mask works registered with the Copyright Office between 2008 and 2012, which is a small fraction of the other types of intellectual property works registered or granted during that time. In fact, only one federal case, Brooktree Corp. v. Advanced Micro Devices, Inc., has ever analyzed the statute in detail and found a violation. Even in that case, the court upheld a substantial jury verdict under the SCPA, but only where there was a clear ability to compare the protected work and the infringing chip. In practice, mask works have proven to be a minor part of copyright law. The rapid advancement of technology has made the SCPA irrelevant. Modern smartphones serve as a perfect example of why this intellectual property right is obsolete. It would be impossible to reverse engineer the "mask" of a smartphone's "system on a chip" containing billions of transistors in the time necessary to constitute an SCPA violation. This is true for most chips used in modern electronics. Additionally, even if a small portion of the design were pirated, the specialized nature of these chips makes them useless for any other purpose, rendering them commercially unviable. For these reasons, the SCPA has never found its intended audience in the modern age.

But two technological trends may once again enable the practice of copying semiconductor designs and revitalize the SCPA as an intellectual property tool. First, the widespread use of CMOS technology is becoming mature, which means that the secrets and distinctions that previously distinguished different companies' CMOS technologies are becoming fewer and less profound. As CMOS technology becomes more of a commodity, line-by-line copying of designs becomes possible. Second, and more significantly, semiconductor design and process secrets are being encoded into software that increasingly allows for the creation of semiconductor designs by computer. This includes software that automates the design process and allows for the creation of circuits using predefined logic gates or blocks of circuitry, as well as new technology called "logic synthesis" that can create a circuit design automatically from a description of the chip's functions. These improvements in software and hardware can make it easier for copyists to create chip designs, potentially leading to the practice of "neo-slavish copying" by less skilled individuals.

VI. INTERNATIONAL LAWS

1. **Japanese Act**: Japan was the first country to apply for protection under Section 914 of the SCPA in 1984, one year after the passage of the SCPA. Japan subsequently received protection under this section based on its own Semiconductor Layout Act (SLA) in 1985. The SCPA and the SLA have many similarities, including a ten-year term of protection and a reverse engineering defense. Both are sui generis acts that specifically protect semiconductor chips or integrated circuits and only require registration of the chip, rather than a description of the layout, for protection. The SLA differs from the SCPA in a few keyways. First, the SLA grants protection to all non-nationals, whereas the SCPA requires reciprocity. This means that the SLA is not intended to affect the laws of foreign countries, but only to offer protection to integrated

circuit layouts. Second, the SLA provides broader protection by protecting semiconductor integrated circuits and integrated circuit layouts, whereas the SCPA only protects mask works. This means that the SLA extends protection to layouts created without masks, making it easier to detect infringing integrated circuits. Under the SLA, the owner of an integrated circuit only needs to reverse-engineer an allegedly infringing chip to determine if infringement has occurred, whereas under the SCPA, the owner must extrapolate the mask work layout used to create the allegedly infringing chip to prove infringement. Finally, the SLA also provides criminal penalties in addition to civil remedies for chip piracy, whereas the SCPA only provides civil remedies.

2. **The European Community Directive:** One year after the passage of the Semiconductor Layout Act (SLA), the European Community issued a directive requiring its member nations to adopt national legislation for the protection of semiconductor topography. In response, the United States granted provisional protection under Section 914 of the SCPA to EC members. The minimum requirements of the EC directive are very similar to those of the SCPA, including protection of a semiconductor product's topography, a reverse engineering defense, and similar definitions of the subject matter protected. However, the definition used in the EC directive provides better protection for integrated circuits than the definition used in the SCPA. This is because the EC directive protects the patterns of individual layers making up a three-dimensional topography of an integrated circuit, whether or not masks are used in their creation. The SCPA, on the other hand, only protects mask works representing three-dimensional patterns in a semiconductor chip but does not protect the patterns themselves if they are created without masks. This means that the SCPA does not fully protect the actual layout of an integrated circuit, whereas the EC directive does.

3. Protection in the U.K. and Australia

In 1989, the United Kingdom amended its Copyright, Designs and Patents Act to provide sui generis protection for semiconductor topographies. This protection applies to two-dimensional or three-dimensional topographies fixed in a semiconductor product, and also covers the layer of material used in the manufacture of a semiconductor product. The Act grants the owner of a protected topography design the right to make semiconductor products incorporating the topography and includes a reverse engineering defense.

In Australia, the layout design of an integrated circuit is not protected by copyright law, but is instead covered by the Circuit Layouts Act of 1989. This act provides sui generis protection for semiconductor topographies and was modeled on the SCPA and other foreign circuit protection acts. It grants protection to the original creator of the design layout for ten years and gives them the right to exclusively manufacture and market semiconductor products using the protected topography during this time.

Other mentions include:

4. The Korean Act

5. The Washington IPIC Treaty [6]

VII. CONCLUSION

The Semiconductor Chip Protection Act is a consistent and stringent set of standards for intellectual property proposals that serves a meritorious public purpose. It is consistent with current intellectual property law and does not suffer from theoretical emptiness, but rather adds stability to copyright law. Its provisions protect semiconductor chip products and do not stretch

copyright beyond its philosophical and conceptual limits. This act helps to prevent the vulnerability of copyright law to economic pressures and technological changes.

Also, the SCPA reflects the growing internationalization of intellectual property law in the information age. Ideally, international protection for mask works would be established through multilateral treaty obligations, as is the case for patents, trademarks, and copyrights. Since the United States was the first country to protect mask works through specific implementing legislation, Congress had to create a unilateral scheme that could potentially lead to bilateral and multilateral agreements. Bilateral and multilateral developments have already occurred quickly since the passage of the Act.

The SCPA was full of merits, but we observed it couldn’t outpace the speed of technological advancement as reverse engineering complex "system on a chip" containing billions of transistors would be impossible within the time frame required for an SCPA violation. Additionally, even if a small part of the design were copied, the specialized nature of these chips would make them useless for any other purpose and commercially unviable.

Further, with the discussion about the cases, we can conclude that there are two issues with the Federal Circuit's reliance on copyright law in its decision in Brooktree. First, it is unclear whether copyright law, which protects aesthetic rather than functional designs, is appropriate for mask works, which are functional in nature. Second, the interpretation of infringement under the SCPA remains uncertain even after Brooktree, as the courts have not yet established a clear standard for finding infringement under the SCPA. This lack of clarity is evident in the Brooktree decision itself, where the defendant raised the reverse engineering defense and relied on the SCPA's legislative history, which states that legitimate reverse engineering always produces a paper trail. Despite this, the Federal Circuit ruled that the presence of an extensive

paper trail did not establish a reverse engineering defense as a matter of law, despite the defendant's assertions to the contrary. The paper trail may be evidence of independent effort, but it may also indicate the infringer's failure to create an original mask work based on the reverse-engineered protected mask work.

ACKNOWLEDGMENT

The author would like to express his gratitude to **Professor Michael Jacobs** for his invaluable and perceivable lectures that have helped us comprehend and develop better understanding of the subject matter in cogent manner.

REFERENCES

[1] Office, U.S. Copyright. “Chapter 91: Protection of Semiconductor Chip Products.” Chapter 9 - Circular 92 | U.S. Copyright Office. https://www.copyright.gov/title17/92chap9.html.

[2] Brooktree Corp. v. Advanced Micro Devices, Inc., 705 F. Supp. 491 - Dist. Court, SD California 1988 https://scholar.google.com/scholar_case?about=17935297667065516024&hl=en&as_sdt=20000006&as_vis=1

[3] “Findlaw's United States Ninth Circuit Case and Opinions.” Findlaw https://caselaw.findlaw.com/us-9th-circuit/1302809.html

[4] Patentlyo Dennis Crouch, Associate Professor, University of Missouri School of Law https://patentlyo.com/patent/2005/09/ninth_circuit_u.html

[5] Kasch, Steven P. "The Semiconductor Chip Protection Act: Past, Present, and Future." High Tech. LJ 7 (1992): 71.

[6] Radomsky, Leon. "Sixteen years after the passage of the US semiconductor chip protection act: is international protection working." Berk. Tech. LJ 15 (2000): 1049.