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Semiconductor Chip Protection

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SEMICONDUCTOR CHIP PROTECTION

I. INTRODUCTION

Prior to 1984, an integrated circuits ("IC") manufacturer had to rely on patent and copyright laws to protect the intellectual property represented in his IC. Special problems inherent in the technology and manufacturing process make those forms of protection inadequate.

Since 1984, four documents have been produced which attempt to remedy the situation:

1. The Semiconductor Chip Protection Act of 1984 (U.S.).[1]

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1. 17 U.S.C. §§ 901-914 (Supp. IV 1986).

2. The Act Concerning the Circuit Layout of a Semiconductor Integrated Circuit (Japan).[2]

3. The Proposal for a COUNCIL DIRECTIVE on the Legal Protection of Original Topographies of Semiconductor Products (Commission of the European Communities).[3]

4. The Committee of Experts on Intellectual Property in Respect of Integrated Circuits Draft Treaty (World Intellectual Property Organization).[4]

The Proposal and Draft Treaty attempt to create a uniform set of minimum rights on a global scale upon which IC manufacturers may rely in estimating the costs and risks of doing business. However, as proposed, both documents fall short of achieving that goal. Both allow too much flexibility in the drafting of laws in each signatory state. The most glaring flaw in each is that, although in theory the promise of injunction is held out, in practice signatory states could formulate a system in which no injunctive relief would be available to the manufacturer.

II. THE TECHNOLOGY

A. *Design*

All ICs are constructed from a small number of traditionally discrete circuit elements such as resistors, transistors and capacitors. In the integrated circuit, each of these elements is formed from layers of different semiconductor materials. The resulting elements are interconnected in accordance with the design by the holes and channels in each layer of the IC.

Initially, an IC designer must decide upon the operating characteristics of the IC. He then must create an actual IC having those specific characteristics. The designer resembles a baker who is making a

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2. Act Concerning the Circuit Layout of a Semiconductor Integrated Circuit, Law No. 43 (1985) (Japan), *reprinted in* World Intellectual Property Organization (WIPO) Committee of Experts on Intellectual Property in Respect of Integrated Circuits, *Legislative Texts Concerning the Protection of Layout-Designs of [Semiconductor] Integrated Circuits*, WIPO Doc. IPIC/CE/II/INF/2 at 9-20 (1986) [hereinafter Japanese Act].

3. Commission of the European Communities, *Proposal for a Council Director on the Legal Protection of Original Topographies of Semiconductor Products* (1985), *reprinted in* WIPO Doc. IPIC/CE/II/INF/ 2 (1986), *supra* note 2, at 21-30 [hereinafter European Proposal].

4. World Intellectual Property Organization Committee of Experts on Intellectual Property in Respect of Integrated Circuits, *Memorandum of the Director General*, WIPO Doc. IPIC/CE/II/2 (1986) [hereinafter Draft Treaty].

special cake, one layer at a time. Each layer of the cake is a different type of semiconductor material, *i.e.*, a different flavor. It is the combination of layers that makes every design unique. The "flavor" and the shape of the layers determine the circuit's characteristics.

As the designer completes baking a layer, he places it on top of the last layer, takes out the electronic equivalent of a hammer and chisel, and digs channels and holes through the newest layer at carefully selected locations. This procedure is performed on each successive layer until the desired circuit is formed. The electrical interplay of the semiconductor materials along the channels and holes causes the circuit to function. The characteristics of the circuit can be changed by altering either the "flavor" of the semiconductor material used in a given layer, or by altering the shape and number of channels cut into a given layer.[5]

B. *Manufacturing*

The IC begins with a base layer usually made of silicon. Upon this substrate layer, the designer deposits the primary layer. A mask which contains the designer's layout for holes and channels in the first deposited layer is placed over the substrate layer. The designer then etches the first layer so that it contains a pattern of holes and channels corresponding to the pattern on the mask. Next, he deposits a second layer, uses another mask to etch another pattern, and deposits a third layer. This process continues until the designer has constructed all the layers of each element. As a result of this process, the pattern contained on each mask is the key to the design of the IC.[6]

C. *Copying*

Once the patterns are designed, the IC is very inexpensive to produce. Though the design of the patterns, and therefore the masks, requires a large number of costly engineer-hours,[7] the copyist's job is simple. First, he acquires the chip and takes a picture of the surface layer. Next, he removes the surface layer and takes a picture of the next layer. This process continues until the copyist has a photograph of each layer.[8] Those photographs allow him to make the necessary masks to copy the IC. This copying process is very inexpensive, and the copy-

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5. *See generally*, H.R. REP. No. 781, 98th Cong., 2d Sess., at 12-14 (1984) [hereinafter HOUSE REPORT] for a more detailed discussion of the manufacturing process.

6. *Id.* Therefore, protection of the mask protects the IC since the IC cannot be reproduced without this pattern.

7. The development cost for a single chip can be as much as $100 million. *Id.* at 2.

8. *Id.*

ist is thus able to enter the market at a much lower price than the original designer.[9]

D. *Industrial Practice*

In the IC industry, there are a number of practices which are considered "fair play" and which any circuit protection law must take into account.[10] "Reverse engineering" is a term used loosely in current laws which generally refers to all accepted competitive practices. In order to understand the laws, it is important to differentiate those practices.

First, one can make a copy of a competitor's IC without analysis of the workings of the IC (*i.e.*, "copying").[11] Second, one can study a competitor's IC for the purpose of teaching, or analyzing the IC (*i.e.*, "study").[12] Finally, one can make a chip from the study of a competitor's IC which will perform the same function (*i.e.*, "second sourcing").[13]

The only practice which must be prohibited is copying. Allowing study serves the same purpose of the patent disclosure requirement in that the public can maintain the same technical level. Protection is preserved because studying a competing IC costs a substantial amount of time and money, and therefore puts the second sourcer in the same competitive situation as the original designer.[14] Second sourcing is currently accepted by the IC industry and does not defeat the purpose of patent protection.[15] Furthermore, allowing second sourcing and reverse engineering does not create an evidentiary problem in infringement actions if it is used as an affirmative defense.[16] By the nature of IC design, any circuit which can be used as a substitute for the protected design is a copy. A designer who works toward the same operating

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9. *Id.*

10. *See id.* at 21 for a more detailed explanation of those practices.

11. *Id.* This consists of removing each layer and taking pictures as each layer is removed. The resulting pictures are used to make the masks which are used to make the copy of the IC.

12. *Id.* This involves something more than copying. The study of the circuit will discover any "smoking guns" left by the original designer. An example of such a smoking gun is a bank of transistors which were left in merely because it was inconvenient to remove them from the design.

13. *Id.* Here, the second sourcer has found the smoking guns (usually at great cost) and can produce a compatible circuit in which he may or may not make slight improvements in the operating characteristics.

14. *Id.*

15. *Id.*

16. *Id.*

characteristics without copying will not design a compatible product.[17] When he faces the same tradeoffs as the original designer, he will make some of them differently. The resulting circuit may have similar operating characteristics, and it may compete with the original circuit in the market, but it will have a different geometry and be unusable as a substitute part.[18] The second sourcer and reverse engineer will create a paper trail behind them which is good evidence of their additional work beyond the copying stage.[19]

III. TRADITIONAL PROTECTION

A. *Purpose of Protection*

Industrial intellectual property protection should recognize the need for invention protection from copyists who would make money from the inventors' efforts without paying for them. Legislation should also recognize that exclusive protection for a limited time provides incentive for research into new areas.[20] Because research efforts can be very expensive and take a long time to pay for themselves, it is sensible to protect them. Modern governments recognize the desirability of encouraging research, and do so in their patent laws.[21]

B. *Patents*

Patent protection allows the inventor to openly use his invention without the danger that a copyist will steal his invention and exploit it. As an example, assume that it costs an inventor $100 million dollars in research costs to conceive of a device and produce a workable model of his idea. Also assume that it only costs $50,000 for a copyist to reproduce the device. The inventor must be protected from the copyist

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17. *Id.*

18. For example, the independent designer will have different useless banks of transistors. These differences will change the layout and the operating characteristics slightly. It will not be pin to pin compatible.

19. He will also probably detect any "smoking guns" which the designer left behind. A smoking gun may be a bank of dummy transistors which cannot be detected without reverse engineering and analysis.

20. *See, e.g.*, HOUSE REPORT, *supra* note 5, at 1, which reads "The purpose of the legislation is to protect semiconductor chip products in such a manner as to reward creativity, encourage innovation, research and investment in the semiconductor industry, prevent piracy, while at the same time protecting the public."

21. For example, the U.S. Constitution reads: "The Congress shall have the Power . . . to promote the progress of . . . useful Arts, by securing for limited Times to . . . Inventors the exclusive Right to their . . . Discoveries. U.S. CONST. art. I, § 8, cl. 8.

or he will have no incentive to do the initial research. Patent laws provide that protection.[22]

Patent laws are designed to protect the fruits of research by protecting inventions which are "novel"[23] and "non-obvious."[24] They are not designed to protect the fruits of development. This is in spite of the fact that "development," the process of taking a product idea and mak-

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22. For example, the U.S. protects patents which are "non-obvious" to a man of ordinary skill in the art *at the time of invention.* 35 U.S.C. § 103 (1982).

23. Novel inventions are ones which not only are new to the inventor, but which are also new to the public. In the U.S., the novelty requirement is codified at 35 U.S.C. § 102 (1982).

24. This is an objective test which has been the subject of much litigation. For example, the U.S. has a non-obviousness requirement which reads:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

35 U.S.C. § 103 (1982).

It should be noted that it is the invention itself, not the process by which the inventor conceives his invention, that is scrutinized. *See* Earle v. Sawyer, 4 Mason 1, 6 (Circuit Court of the United States, Mass. 1825).

There are three conditions which are relevant to determine non-obviousness: "[T]he scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art . . . ." Graham v. John Deere Co., 383 U.S. 1, 17 (1966). Secondary considerations such as "commercial success, long felt but unsolved needs, [and] failure of others" may have relevance. *Id.* at 17-18.

The non-obviousness requirement is further discussed in a series of cases in the Court of Appeals for the Federal Circuit. For an in depth study of this topic, see Medtronic, Inc. v. Cardiac Pacemakers, Inc., 721 F.2d 1563 (Fed. Cir. 1983) (in determining obviousness/non-obviousness, an invention must be considered as a whole); Fromson v. Advance Offset Plate, Inc., 720 F.2d 1565 (Fed. Cir. 1983) (the court must consider whether the claimed invention as a whole would have been obvious to one of ordinary skill in the art at the time it was made); Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d 1530 (Fed Cir. 1983) (evidence arising out of secondary considerations must always, when present, be considered for a determination of obviousness); Environmental Designs, Ltd. v. Union Oil Co., 713 F.2d 693 (Fed. Cir. 1983) (the determination of obviousness involves the three factors in *Graham*, 383 U.S. 1, and any additional evidence, which may serve as indicia of non-obviousness).

The theory first appears in Hotchkiss v. Greenwood, 52 U.S. 248 (1850), in which the Court held that if an ordinary mechanic acquainted with the business possessed the ingenuity and skill necessary to construct the invention, the patent would be void. *Id.* at 266.

ing the actual product, can be extremely expensive.[25] However, the fruits of development are not protected by patent laws unless the product itself is a fruit of earlier protected activity.[26]

For example, assume that the idea for a product is quite obvious to anyone, and that it is not the fruit of a discovery or research. Also assume that the product is complicated and making the design choices needed to create the product takes hundreds of design hours costing $100 million dollars. Finally, assume that once the tedious process of making those choices is done, and the product is on the market, a copyist can simply examine it and see what those choices were at a cost of $50,000. The designer must have protection from the copyist, or like the inventor, he will have no incentive to perform the development work. Under patent laws, the product designer is not protected because patent law looks to the novelty and obviousness of the product, not the difficulty of development.[27]

An IC is just like the product described above. Development costs may run into the hundreds of millions of dollars, yet chip pirates can photograph each layer of the chip and make the masks required for production of that chip for only a fraction of the cost.[28]

C. *Copyright*

Copyright is the traditional protection for the form of expressions of ideas, and it covers a large number of categories, such as writings, music, and works of art.[29] It also covers derivations of a copyrighted

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25. HOUSE REPORT, *supra* note 5, at 2.

26. The obviousness requirement examines the time of invention. There is nothing in the patent laws which addresses the cost of bringing the invention to market.

27. *Id.* at 3.

28. *Id.* at 2.

29. The U.S. has seven categories of copyrightable subject matter:

> Copyright protection subsists, in accordance with this title, in original works of authorship fixed in any tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device. Works of authorship include the following categories:
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> (1) literary works;
> (2) musical works, including any accompanying words;
> (3) dramatic works, including any accompanying music;
> (4) pantomimes and choreographic works;
> (5) pictorial, graphic, and sculptural works;
> (6) motion pictures and other audiovisual works; and
> (7) sound recordings.

17 U.S.C. § 102(a) (1982).

work, such as a play derived from a novel. In some cases, copyright will cover the three-dimensional derivation of a two dimensional copyrighted work.[30]

The doctrine providing protection for derivations of copyrighted works, the "doctrine of derivative works,"[31] would seem to protect semiconductor ICs. However, ICs are utilitarian by nature, and few countries allow protection of utilitarian objects under their copyright laws.[32]

IV. CURRENT PROTECTION

In 1984, the United States passed the Semiconductor Chip Protection Act ("SCPA").[33] The SCPA is a unique form of industrial intellectual property protection based on the ideas of economic incentive, exclusionary rights, and reverse engineering.[34] On May 31, 1985, the Japanese promulgated the Act Concerning the Circuit Layout of a Semiconductor Integrated Circuit.[35] At this time, these acts are the only existing legislative initiatives for IC protection, and promise to be the most important, since the United States and Japan supply and use the majority of the world's ICs.[36]

A. *Originality*

The SCPA allows protection for mask works which are original to the designer, as long as they are not commonplace in the market.[37] The

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30. The U.S. statute reads:

(a) The subject matter of copyright as specified by section 102 includes compilations and derivative works, but protection for a work employing preexisting material in which copyright subsists does not extend to any part of the work in which such material has been used unlawfully.

(b) The copyright in a compilation or derivative work extends only to the material contributed by the author of such work, as distinguished from the preexisting material employed in the work, and does not imply any exclusive right in the preexisting material. The copyright in such work is independent of, and does not affect or enlarge the scope, duration, ownership, or subsistence of, any copyright protection in the preexisting material.

17 U.S.C. § 103 (1982).

31. 1 M. NIMMER, NIMMER ON COPYRIGHT § 3.01 (1987).

32. HENN, COPYRIGHT PRIMER, at 42, n.22 (1976).

33. 17 U.S.C. §§ 901-914 (1982 & Supp. IV 1986).

34. S. REP. NO. 425, 98th Cong., 2d Sess. 1 (1984) [hereinafter SENATE REPORT]; *see also* HOUSE REPORT, *supra* note 5, at 1-5.

35. Japanese Act, *supra* note 2.

36. Draft Treaty, *supra* note 4, at 4.

37. 17 U.S.C. § 902(b) states: "protection under this chapter shall not be availa-

Japanese have a similar standard, which requires that a "circuit layout" be made by the creator,[38] as well as prohibiting exclusive rights in "a circuit layout created by another person."[39] Though statutes provide protection to the creator of an original work without allowing exclusionary protection of circuits which are in the public domain, there is a difference in their scope. Under the SCPA, an IC designer could get exclusionary protection for an "original" (made by him) circuit which had been made by another in the past, unless the circuit is "commonplace."[40] The Japanese Act, on the other hand, only protects circuits which have not been "created by another."[41] This is a higher standard which approaches "novelty," the first requirement under current patent law.[42]

Interpretation of these statutes on a case-by-case basis promises to be difficult, even though the evidence of originality and reverse engineering may be clear and undisputed.[43] For example, determining the originality of a circuit may be a problem. Assume that in the public domain there is a circuit using elements A, B, C, and D. Further assume that each of those elements also exists as a separate circuit in the public domain, and that the only time they have been combined is in the ABCD combination. May a designer obtain protection under either Japanese or U.S. law for the combination AB, even though the combination AB is known as possible? What about ABC? He cannot protect ABCD, but does he have to add a fifth element E in order to have a protectable design? The legislative history of the SCPA only provides that the design must be taken as a whole in making that determination,[44] and as yet, there is no case law on either statute.

B. *Length of Protection*

The SCPA provides a ten year term of protection for an integrated

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ble for a mask work that . . . consists of designs that are staple, commonplace, or familiar in the semiconductor industry . . . ." 17 U.S.C. § 902(b)(Supp. IV 1986).

38. Japanese Act, *supra* note 2, § 8-1(1) states that an applicant for the layout right may not receive the right if "the applicant is not the creator."

39. *Id.* § 12-1.

40. 17 U.S.C. § 902(b)(Supp. IV 1986).

41. Japanese Act, *supra* note 2, § 12-1.

42. *See supra* note 25.

43. Although the evidence may be clear, calling the line between copying of concept and original work in a second sourcing circuit promises to be difficult and litigated a great deal.

44. HOUSE REPORT, *supra* note 5, at 21.

circuit mask.[45] The period begins with the circuit's registration at the Copyright Office or its first commercial exploitation, whichever comes first.[46]

The "circuit layout right" in the Japanese Act also lasts ten years,[47] and there is no right for one who fails to register within two years of the first commercial exploitation.[48] However, there is no right established before registration.[49] This could have two effects. First, it leaves the door open for intervening rights in Japan between the time of first commercial exploitation and registration. Second, if the designer is willing to take the risk of intervening rights, then he can delay registration and prolong protection for as long as twelve years after the first commercial exploitation of his circuit.[50]

C. *Reverse Engineering*

The United States Congress provided for "reverse engineering" in the SCPA, thus recognizing this industry practice; however, the language used does not specifically state that "second sourcing" (produc-

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45. The relevant section reads:

(a) The protection provided for a mask work under this chapter shall commence on the date on which the mask work is first commercially exploited anywhere in the world, whichever occurs first.

(b) Subject to subsection (c) and the provisions of this chapter, the protection provided under this chapter to a mask work shall end ten years after the date on which such protection commences under subsection (a).

(c) All terms of protection provided on this section shall run to the end of the calender year in which they would otherwise expire.

17 U.S.C. § 904 (Supp. IV 1986).

46. *Id.*

47. Japanese Act, *supra* note 2, § 10-2. Section 10-2 reads: "The terms of the circuit layout right shall be 10 years from the date of its registration for establishment."

48. *Id.* § 6. Section 6 reads:

Registration for establishment may not be obtained in cases where the creator, etc., or a person who has obtained a grant [of use right] from the creator, etc., has performed an act referred to in Section 2, paragraph 3, item (2), for business purposes with respect to the applied-for circuit layout, two years or more prior to the date of application.

Section 2(3)(2) reads, "the transfer, lease, exhibition for the purpose of transferring or leasing, or the import of semiconductor integrated circuits manufactured by utilizing the circuit layout (including goods incorporating such semiconductor integrated circuits)." *Id.* § 2(3)(2).

49. *Id.* § 10-1 reads, "A circuit layout shall be created upon its registration for establishment."

50. *Id.* § 27 allows for compensation from intervening rights holders.

tion of pin-to-pin compatible circuits) is allowable.[51] The statute states that a person may reproduce the mask work in order to study it, and he may "incorporate the result of such conduct in an original mask work which is made to be distributed,"[52] but nothing more. The legislative history of the bill, however, reveals an intent to allow a directly competing circuit to be produced from the study.[53]

The Japanese Act is less clear. It states: "The effect of a circuit layout right shall not extend to the manufacture of a semiconductor integrated circuit which is made by utilizing the registered circuit layout for the purpose of analyzing or evaluating the semiconductor integrated circuit."[54]

It is unclear what "manufacture . . . made by utilizing" means. It appears to allow the copying of the circuit for study purposes only. The Japanese had access to the SCPA as an example of IC protection, yet they chose different language for their "reverse engineering" section.[55] There is no language corresponding to Section 906(a)(2) which specifically allows incorporation of protected masks in a new work once the reverse engineering study has been conducted.[56] This may mean that the Japanese Act prohibits incorporating protected masks in a noncompatible, more sophisticated IC and second sourcing.

D. *Marking*

The SCPA does not require marking of the mask work in order to take advantage of the protection of the statute.[57] However, it does state that a mask work's owner may mark it with his name, or an abbreviation thereof which is generally known, or with an "M" surrounded by a circle.[58] This marking provision is very important to the effectiveness of the law because such marking is *prima facie* evidence of notice of protection in an infringement suit.[59] Without marking, relief is still available, but the infringer must have notice of protection.[60]

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51. 17 U.S.C. § 906 (Supp. IV 1986).
52. 17 U.S.C. § 906(a)(2) (Supp. IV 1986).
53. HOUSE REPORT, *supra* note 5, at 21-23.
54. Japanese Act, *supra* note 2, § 12-2.
55. *Id.*
56. *Compare id. with* 17 U.S.C. § 906 (Supp. IV 1986).
57. The SCPA states: "The owner of a mask work provided protection under this chapter may affix notice to the mask work . . . in such a manner and location as to give reasonable notice of such protection." 17 U.S.C. § 909(a) (Supp. IV 1986).
58. *Id.*
59. *Id.*
60. *Id.*

The Japanese Act has no marking provision, therefore the chip pirate may be required to have actual notice of protection.[61] However, injunctions are only available under the Japanese Act when the infringer is not a "Person Acting in Good Faith."[62] A "Person Acting in Good Faith" is one who does not know (and is not at fault for not knowing) that the circuit he is selling is registered.[63] Without a marking requirement, proving that the pirate had knowledge or is "at fault for not knowing" will be difficult, and the consequence of not showing his bad faith will be failure to prove infringement.[64] The only relief available to the mask owner in such a case is monetary damages in the "amount . . . which would normally have been received for the use of the registered circuit layout."[65] Even in that case, the injured party must still prove that the pirate was at least negligent as to his knowledge of registration.[66]

E. *Summary*

The SCPA and Japanese Act are both good starting points for protection of ICs. They both recognize the need for a low standard of creative effort, set a realistic term for protection, and allow competition in the industry.

The weaknesses lie in their failure to provide specific guidance for the courts for interpreting exactly what practices are allowed in competition. The Japanese Act has a further weak point in that it does not provide for a marking system.

These laws provided the starting point for the two international treaties currently under consideration. Both the strengths and weaknesses of the laws are reflected in the treaty documents.

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61. Japanese *Act*, *supra* note 2, § 24-1. Section 24-1 reads:

> The transfer, lease, exhibition for the purpose of transferring or leasing, or the import for business purposes, of semiconductor integrated circuits, by a person who, at the time of delivery of the semiconductor integrated circuits . . . does not know and is not at fault for not knowing . . . that such semiconductor integrated circuits were manufactured by utilizing a circuit layout imitated from a registered circuit layout involving another's circuit layout right or sole use right . . . , shall not be deemed an infringement of the circuit layout right or sole use right.

62. *Id.*

63. *Id.*

64. *Id.*

65. *Id.* § 24-2

66. *Id.* § 25.

V. TREATIES

A. *Commission of the European Communities*

In December of 1985, the Commission of the European Communities produced the "Proposal for a Council Directive on the Legal Protection of Original Topographies of Semiconductor Products."[67] This proposal is intended to create uniform rights for semiconductor products within the Common Market, and to provide a framework for establishing semiconductor laws within the member states.[68] It is modeled after the Japanese and American Acts, but specifically allows that each member may have a great deal of flexibility in producing the minimum rights.[69]

1. *Originality*

The Council Proposal requires a high level of innovation for protection similar to the U.S. and Japan. Like the United States Act, the Proposal speaks of originality and commonplace elements:[70]

> However, the topography of a semiconductor product shall not be protected unless it satisfies the condition that it be original in the sense that it is the result of its creator's own intellectual effort. Where the topography of a semiconductor product consists of elements that are commonplace in the semiconductor industry, it shall not be considered original unless the combination of such elements, taken as a whole, is original and not commonplace.[71]

2. *Length of Protection*

Article 6 of the Proposal allows for a term of protection of at least ten years, measured from the date of first commercial exploitation, or the date of registration, whichever comes last.[72] The words "at least"

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67. European Proposal, *supra* note 3.
68. *Id.*
69. *Id.*
70. *Id.* art. 2, ¶ 3.
71. *Id.*
72. *Id.* art. 6, ¶ 1. It reads:

> The exclusive rights to which reference is made in Article 2 shall come to an end on a date at least ten years from the date on which the topography is first commercially exploited or, where registration is a condition for the subsistence of protection, from the date on which the topography is first commercially exploited

are significant since they allow a member state to grant protection for more than ten years. However, the proposal does not allow protection to extend for more than fifteen years after the topography is fixed or encoded.[73]

In countries where there is no registration, protection will begin with the first commercial exploitation. Where registration is required, the IC manufacturer will need to be careful not to commercially exploit before he registers, or intervening rights may arise.[74]

3. *Reverse Engineering*

The Council provides for reverse engineering in Article 5, paragraphs 2 and 3, which provide in pertinent part:

> 2. The exclusive right . . . shall not apply to reproduction for the purpose of analyzing, evaluating or teaching the concepts, processes, systems or techniques embodied in the topography or the topography itself.
> 3. The exclusive right . . . shall not extend to any such act in relation to an original topography created on the basis of an analysis and evaluation of another topography carried out in conformity with paragraph 2.[75]

Like the United States, the Council provides for reverse engineering in two separate steps.[76] This suggests that the Council intends to allow second sourcing, but interpretation of this section by each individual state could lead to widely different results. Paragraph 3 apparently does not allow a second manufacturer to create a competing IC after going through the process described in paragraph 1, even with a "paper trail." It seems to allow a second manufacturer to use the information learned in the reverse engineering process only to create non-competing ICs. This presents a problem.

There is no reason to prohibit second sourcing. The processes of reverse engineering and second sourcing can cost as much as the origi-

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or the date on which it is registered, whichever is the later.

73. *Id.* art. 6, § 2 reads in pertinent part, "[t]he exclusive rights shall come to an end not later than fifteen years from the date on which the topography is first fixed or encoded."

74. *Id.* art. 5, § 5 only allows payment of royalties for the innocent infringer, but does not speak of persons acting before registration.

75. *Id.* art. 5, §§ 2-3.

76. *Id.*

nal development and will be evidenced by the "paper trail" created.[77] Therefore, unlike the copyist, the second sourcer will not have an unfair competitive advantage, and the public will still have the benefit of open competition in that particular circuit's market.

To remedy this situation, the Council should amend the Proposal, or the member states should carefully draft laws allowing second sourcing. Presently, however, the interpretation of this Article is left to each member state.

4. *Infringement*

Article 4 of the Proposal states in part: "The member States may provide that protection shall no longer apply to the topography of a semiconductor product unless it has been registered with a public authority within two years of its first commercial exploitation."[78]

Under this Article, a member state must either require registration, or have no registration at all. Registration is preferable in that it would give some notice to the world that an IC is protected. Without a registration system, marking would have to be mandatory in order for any manufacturer to have notice that a particular IC is protected. Unfortunately, Article 8 of the Proposal allows members to have a system which does not make marking available.[79] Therefore, a member state could set up a system of protection without registration or marking, thus leaving an intellectual property right for which proving willful infringement would be difficult. While the Proposal does avoid one weakness of the Japanese Act with respect to innocent infringement, it still lacks effective injunctive relief. The applicable section of the Japanese Act states:

> The transfer, lease, exhibition for the purpose of transferring or leasing, or the import for business purposes, of semiconductor integrated circuits, by a person who, at the time of delivery . . . does not know and is not at fault for not knowing . . . that such semiconductor integrated circuits were manufactured by utilizing a circuit layout imitated from a registered circuit layout . . . shall not be

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77. HOUSE REPORT, *supra* note 5, at 21.

78. European Proposal, *supra* note 3, art. 4, § 1. It continues: "Member States may require in addition to such registration that material identifying, describing or exemplifying the topography or any combination thereof has been deposited with a public authority." *Id.*

79. *Id.* art. 8 reads, "Where the legislation of Member States provides that semiconductor products manufactured using protected topographies may be distinctively marked, the mark to be used shall be a capital T in a circle . . . ."

deemed an infringement of the circuit layout right . . . .[80]

The Act does not state, "One who is a transferee, lessee . . . ." The difference is that under this Act as worded, a transferror or lessor is exempted from injunctions unless the registered party can show knowledge. Exempting transferees and lessees from injunctions and damages as innocent infringers has some equitable merit, since they may have made substantial investments in good faith. Allowing them to recover their investments by selling off their inventories is not too injurious to the IC designer. This is especially true if the transferee's supply will be cut off by enjoining the transferror who presumably does not have an "empty head and a pure heart." Under this section as written, there would be no presumption of knowledge on the part of the transferror or lessor unless the registered party can demonstrate knowledge. Since there is no ability to mark in Japan, proving knowledge of registration (or fault for not knowing) will be difficult at best.

The European Council Proposal only exempts persons who "purchase a semiconductor product without reasonable grounds to believe that its manufacture infringed the exclusive right . . . ."[81] This allows the injured party to go after the chip pirate more easily than in Japan and without an undue legal risk being placed upon innocent purchasers. However, it does not allow the injured party to enjoin those purchasers after they have notice of infringement. Such an injunction is an important remedy because it prevents further purchases from pirates after notice of infringement. The purchaser could continue to buy from pirates who might not be within the jurisdiction of the member state. The innocent purchaser should be allowed to recover his up-front costs such as inventory, but he should not be allowed to become the marketing agent for a foreign pirate.

B. *World Intellectual Property Organization*

The World Intellectual Property Organization ("WIPO") is currently negotiating a treaty which if ratified would cover the protection of semiconductor chip products.[82] The Draft Treaty is based on the

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80. Japanese Act, *supra* note 2, § 24-1.

81. European Proposal, *supra* note 3, art. 5, ¶ 4(b).

82. WIPO is an intergovernmental organization designed as a "special agency of the United Nations. It is responsible for the promotion of the protection of intellectual property throughout the world . . . ." As of January 1, 1986, 112 countries were member states of WIPO, additionally, there are twelve states which are a party to WIPO administered treaties, but are not members of the Organization. WIPO, GENERAL INFORMATION BROCHURE, WIPO Pub. No. 400(E) (1986).

American and Japanese laws, and sets out a number of minimum and maximum rights a signatory country would be obligated to provide.[83]

1. *Originality*

Article 2, paragraph 2 of the Draft Treaty provides that in order to be protected, a "layout-design" must be "original."[84] Article 1 defines an "original layout-design" as one which "is the result of intellectual effort," and "has not been copied."[85]

The definition is only a proposal because the delegates could not agree on whether a specific definition was desirable.[86] That disagreement is evidenced by the proposed definition itself, since a design which is not the result of someone's intellectual effort simply could not exist. If that section of the definition is to be read as "the result of the *designer's* intellectual effort," then it has the identical scope as "has not been copied."

Like the Japanese Act, the Draft Treaty's definition of originality does not include a phrase such as, "unless the layout-design is commonplace" in its definition of originality. However, this limitation does occur in Article 3 along with the reverse engineering provisions.[87] Although it seems the level of inventiveness required for protection is the same as is required by the United States SCPA, there is little direction for interpreting that section,[88] leaving a great risk of non-uniform legislation among the contracting states.

The definition should be modified by removing the redundant language in order to prevent twists of interpretation which could result in reading in a requirement not intended. Also, the definition should not be simply a proposal. The signing countries should be required to define the level of innovation required under the treaty. Otherwise, the desired effect of uniformity of protection among signatories will be lost, thus defeating the very reason for creating a treaty for uniform law.

2. *Length of Protection*

Article 5 of the Draft Treaty requires a ten-year protection pe-

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83. Draft Treaty, *supra* note 4.

84. *Id.* art. 2, ¶ 2.

85. *Id.* art. 1(vii).

86. *Id.* at n.34.

87. *Id.* art. 3, ¶ 4(i)-(ii).

88. *Id.* The notes accompanying Draft Articles 3, 59, 60 and 61 give some direction in defining "reverse engineering," but no help for defining the term "commonplace."

riod.[89] Contracting states would have the option of measuring the start of protection from the date of first commercial exploitation, or the date of registration of the IC.[90] As in the European Council Proposal, registration systems are optional.[91]

3. *Reverse Engineering*

Unlike the European Proposal and the Japanese and American Acts, the WIPO Draft Treaty uses the term "reverse engineering" in its discussion of the acts allowable by competitors. The Article 3 provision states:

> [N]o contracting States shall consider unlawful the copying of the layout-design without the authorization of the proprietor in the following cases:
> (i) if the copying is solely for the purpose of analyses, evaluation, or reverse engineering, provided that, where the reverse engineering results in the production of a . . . layout-design, such layout-design is, in itself, original . . . .[92]

Unfortunately, the term "reverse engineering" is not defined by the treaty. The treaty notes that this lack of a definition occurred because the term is understood industry-wide and the definition of the term will evolve along with the technology.[93]

The notes suggest "reverse engineering" covers what is currently accepted by the semiconductor industry as fair play and that second sourcing is also to be allowed.[94] However, the notes also seem to imply that in the future the industry may redefine "fair play" so that practices which might not be acceptable now will become allowable.[95] This

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89. *Id.* at art. 5, ¶ 1 reads:

> The protection provided for in Article 3 shall last at least ten years counted from either of the following two dates;
>
> (i) the date of the registration, in the Contracting State in which protection is claimed, of the proprietor's claim to protection,
>
> (ii) the date on which, anywhere in the world, the proprietor first exploits commercially the original layout-design of an integrated circuit, the microchip that incorporates such layout-design or the industrial article that incorporates such microchip.

90. *Id.*
91. *Id.* art. 4.
92. *Id.* art. 3, ¶ 4.
93. *Id.* at n.60.
94. *Id.*
95. *Id.*

provision allows flexibility, but it may mean that the currently acceptable state of "fair play" in the industry must be proven each time a copyist asserts that he has only done some reverse engineering.

4. *Infringement*

The major difference between the WIPO Draft Treaty and the European Proposal is that the Draft provides some guidelines in the case of intervening rights. Article 5, Section 2 states:

> Where, under the national law of a Contracting State, protection starts only upon registration, but where commercial exploitation has started before registration, the proprietor shall have the right to a reasonable remuneration in respect of any act performed in that State before registration which, after registration, requires his authorization . . . .[96]

Therefore, at least under the Draft Treaty, some remedy is available against a competitor who copies before protection begins.

Article 4 of the Draft Treaty sets out the maximum formalities upon which a contracting state may condition protection, but does not prohibit other formalities which may be made optional within a contracting state.[97] This means that while no contracting state may require marking for protection, it may allow marking to serve as notice of protection of the circuit.

Notice of protection is important under the Draft Treaty, as under the Japanese Act, because an innocent infringer, cannot be enjoined, even after he receives actual notice.[98] Without a registration system or marking to serve as constructive notice, there will be a large number of "innocent" infringers. Therefore, the contracting states should at least

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96. *Id.* art. 5, ¶ 2.

97. *Id.* art. 4. The only restriction on optional formalities is that non-compliance must not deprive the proprietor of protection. Notes accompanying art. 4, ¶ 79.

98. *Id.* art. 3, ¶ 6(i). It reads:

> Notwithstanding the provisions contained in paragraph (1)(a)(iii) and (iv), no Contracting State shall consider unlawful the performance, without the authorization of the proprietor, of any of the acts referred to in those provisions:
>
> (i) where the act is performed, and as long as it is performed, without actual knowledge of the fact that the layout-design is protected, or without reasonable grounds for believing that the layout-design is protected [*innocent infringement*], performance of such acts in respect of microchips or industrial articles acquired before such notice shall entail the obligation to pay reasonable renumeration to the proprietor . . . .

Id.

be required to allow marking to serve as notice of protection. While requiring marking is not essential, the contracting states should recognize voluntary marking.

VI. CONCLUSION

Integrated circuits are one of the most widely used products in the world. They have revolutionized old industries and created new ones. They can be extremely expensive to develop, and, therefore, their development costs must be regained over a large portion of the circuit's market lifetime.

Unfortunately, these same circuits which are quite expensive to develop, are also very inexpensive to copy. A copyist can enter the market and sell the same IC at a much lower price than the original developer and substantially reduce the developer's ability to regain his initial investment. Further, a developer who has lost once will be hesitant to invest again in the second generation, knowing he will be unable to protect his property. If copyists are not prohibited from pirating the IC developer's intellectual property, the investment incentive for new, difficult to develop, and expensive integrated circuits will weaken dramatically.

Traditional intellectual property protection is ineffective to protect the majority of ICs from piracy. The level of inventiveness required for patent protection is too high to cover ICs, and copyright laws are not designed to protect utilitarian articles. This has led to a move toward a new type of intellectual property protection which addresses the specific issues presented by the integrated circuit technology.

In order to achieve a protection system upon which manufacturers can rely, the European Proposal and the WIPO Draft Treaty should be amended to set out in definite terms, a system for giving notice to the public of existing protection. That system should contain permissive marking at a minimum, and provide for injunctive relief against an infringer regardless of innocence in infringement once that infringer has received notice of the protection.

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