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Semiconductors: Critical Analysis of Indian Legal Regime

PRACHI BEHL¹

ABSTRACT

This paper was the attempt to ascertain the current condition of the semi-conductors along with the recent advancement in it. Initially, intellectual property was limited to the copyrights, trademarks and patents. Rapid technological development and rising competition to enter the reign of technologically advanced countries, has led to a revolution of Information Technology which lead to emergence of new branch in the field of intellectual property, namely, Layout-Design has come into being, which is also known as semiconductor integrated circuits. India enforced Semiconductor microcircuit layout Act, 2000 that provides for cover of creator or author of Semiconductor IC layout design.

In this paper, we will study the changes in the notions of semi-conductors from the time of its inception till the current scenario along with an attempt to identify the latest developments that occur in context of the law regarding semi-conductors.

Keywords: Semiconductors, intellectual property

I. INTRODUCTION

In today's era where the environment is very dynamic and competitive environment, Intellectual Property Rights are considered as the crucial element, which is required to maintenance in the market. It is very important for the companies to analyse that what could be protected and how within their respective countries. Initially, intellectual property was limited to the copyrights, trademarks and patents. Later on came legislations making industrial designs and geographical indications as crucial intellectual properties. Rapid technological development and rising competition to enter the reign of technologically advanced countries, has led to a revolution of Information Technology. With the rapid development of information technology, a new branch in the field of intellectual property, namely, Layout-Design has come into being, which is also known as semiconductor integrated circuits.

The semiconductor integrated circuit is an integral part of every chip that is there in a computer. The Very Large Scale Integration (VLSI) are used by the fifth generation computers wherein

¹ Author is a student at Amity University, Noida, India.

numerous transistors are imbibed on a single chip, which helps in reducing the size of the chip as well as increasing the processing power significantly. This leads to the translation into more powerful yet small computers. Therefore, the creation of the layout-design upon a semiconductor integrated circuit is a crucial asset of intellectual property. Several efforts were made by various organizations in order to pass regulations regarding this issue. World Trade Organization was one of those organisations, which has contributed towards the passing of resolution and has resulted in TRIPS agreement covering the intellectual property related issues. Since India is also a signatory of the WTO, it has also passed an Act in the year 2000, which in conformity with the terms of TRIPS agreement, known as SICLDA (**Semiconductor Integrated Circuits Layout-Design Act**), supplement to designs.

It complies with the obligations of Article 35 to 38 of the TRIPS agreement, which is regarding the protection of semiconductor integrated circuits layout- designs.

Intellectual Property refers to the knowledge, which is owned by somebody. Example is a copyright. The copyright acknowledges the ownership of the knowledge and provides the terms of protection for it. However, in the semiconductor and EDA industries, the term Intellectual Property means a design or verification unit that is already packed and ready for licensing.

Semiconductor Intellectual Property and Design Intellectual Property are generally the same thing, merely referred as Intellectual Property. It is a part of the design, example processor, which is already verified and could be included in the design of somebody else. Although, some amount of license fee is attached to its usage as well as royalty for every device made, that includes that intellectual property piece. Intellectual Property has become pre-determinant for the creation of complex devices, as it is difficult for individual companies to develop entire range of blocks, required for these devices.

Commonly known devices for such Intellectual Property are peripherals, memories, processors and interconnect. These can be provided either as soft IP blocks (Example . Processors), i.e technology independent models which can be synthesized to focus on any fabrication process or execution library, or as hard IP blocks(example analog blocks and memories), i.e execution and process targeting have already been performed and there can be no changes to it by licensee.

A pre-packaged set of code that is used, for the purpose of verification is known as Verification IP (VIP). It could either be a set of averments that are used for verifying a bus protocol, or a component, supposed to be used within a particular set of verification methodology.

(A) Aim

This paper studies about the concept of semi-conductors, examines the various conditions that have been led under the Indian law to grant protection to semi-conductors and also to determine the judicial approach towards their protection in India.

(B) Objective

- To study the concept of semi-conductors
- To examine the criteria to semi-conductor
- To study provisions of semi-conductors
- To analyse judicial approach towards semi-conductors

(C) Meaning

Semiconductor Intellectual Property are the Proprietary hardware circuit designs that are licensed for the purpose of usage in chips, that are customised, made from scratch and includes ASIC (Application specific integrated circuit) or FPGA (field programmable gate array).

A **semiconductor** can be termed as a material having electrical conductivity to a degree between a metal, example copper and an insulator example glass. They are the basis of the modern solid state of electronics, including quantum dots, solar cells, transistors, LEDs as well as digital and analogue integrated circuits.

A semiconductor consists of a number of unique properties, including interaction with another phenomenon, example light, which makes a semiconductor effective for constructing a device that can magnify, switch, or convert an energy input or the ability to change conductivity by the way of adding some impurities known as “doping”. Properties of a semiconductor relies upon quantum physics in order to ascertain the movement of electrons inside a lattice of atoms.

II. HISTORY²

It is necessary to notice that the System On Chip (SoC) revolution that's presently driving mobile natural philosophy has one vital enabling technology which is Semiconductor property. Computers and phones would still air our desks for one factor.

Semiconductor IP; soft cores, hard cores, physical information processing, interface information processing, etc not solely scale back the value and time to promote of SoCs, it conjointly dramatically raises the innovation bar.

One of the foremost fascinating, eye catching and enabling things concerning the semiconductor information processing market consist of is that the business model that has

² <https://semiwiki.com/eda/1574-a-brief-history-of-semiconductors/>

evolved.

One of the key enablers for the semiconductor information {processing Intellectual Property science, scientific discipline} market phase was process migration.

In 1990s Sagantec layout migration tool not solely touched information to new process nodes, it conjointly migrated many various styles of information processing to multiple foundries as well as customary cells, embedded recollections, and custom information processing blocks. One in every of Sagantec's biggest customers was Intel United Nations agency migrated x86 processors down the method road map for multiple generations. This migration technology, IMHO, was one in every of the catalysts for the semiconductor information processing revolution that we tend to experiencing nowadays.

The other catalyst was the economic downswing of the 1990's. Semiconductor firms jettisoned internal information processing teams to chop prices. These engineers later became information processing firms providing product and services to the executives that cut them. skilled worker elements and Virage Logic of the foremost notable however there have been virtually many others. each skilled worker and Virage were Sagantec migration customers by the means. While enabling the industrial information processing market, layout migration technology conjointly restricted the migration tools' total offered market. customary cells for

Eg; skilled worker would build one galvanic cell library for TSMC and migrate it to multiple foundries and method nodes nearly eliminating internal galvanic cell library development at semiconductor firms.

Virage Logic did an equivalent for SRAMs and plenty of different firms followed suit in different semiconductor information processing market segments.

Unfortunately, the information processing market got terribly jam-pawncked and ASPs born quickly from \$1M to \$50k for a customary cell library forcing a business model amendment. skilled worker elements gets full credit for this one in my book, they modified from AN direct licensing model to a royalty model backed by the foundries. Seriously, what once value \$1M was currently unengaged to customers with a royalty paid to the information processing firms by the foundries supported wafer sales. ARM terminated up shopping for skilled worker for \$900M and Synopsys bought Virage Logic for \$350M. The royalty primarily based information processing business model was definitely behind these "healthy" valuations, absolutely.

Not to be control surely by to a fault aggressive royalty demands, foundries started internal

information processing development as a complimentary service to market style starts and wafer sales.

Nowadays, TSMC has the biggest industrial information processing catalog and Si validation program enabling semiconductor information processing firms round the world. The TSMC information processing effort is business leading with many several bucks invested with within the fabless semiconductor style enablement system.

ARM has done an analogous transformation of the micro chip market blindsiding even the mightiest of semiconductor firms Intel Corporation. ARM conjointly enabled the SoC revolution with a additional balanced business model of direct license fees, royalty revenue from each chip oversubscribed by customers incorporating ARM information processing, and revenues from connected development tools and client support. Currently the resulting ARM ecosystem is second to none which makes the David and Goliath battle against Intel for mobile, laptop, and cloud SoCs a fair fight.

Infringement of Layout Design

Infringement of layout style takes place once not being the registered businessman will any act like

- a. Reproducing layout style in its entirety or its half except once it's not original or
- b. Importing, mercantilism or distributing for business purpose a commentary incorporating such registered layout style.

Provided such higher than acts wouldn't quantity to infringement if used for scientific analysis, analysis, analysis or teaching. Reverse decipherment of those circuits if doable if such analysis is employed to know the scientific principle concerned in these circuits or for any innovative purpose Or Provided on the premise of analysis of registered layout style if somebody produces another original article.

Distinctiveness in Circuit or Design

Now a day's variety of latest technique like VLSI or triple layer buffering or nano technology concerned in manufacture or production of electronic elements wherever thousands of components area unit designed on a layer put in in embedded style technology technique bring forceful changes in coming up with being distinct in itself in use yet as operate. For registration purpose every style or its layout or overall should satisfy the registration demand i.e. distinctive. One of the most important question concerned is what area unit the parameters of distinctiveness.

However there's no list of such factors, although area unit sure parameters that area unit so useful to search out distinctiveness, list isn't thoroughgoing.

They are:

- elements concerned or element grouping in a very circuit, key operate performed (distinct application) like management mobile show or recreation operate or sure motor of robots etc.,
- distinguishable in terms of temporal arrangement (clock rate), read, write or refresh command signals, frequency used or
- technique deploy in doing pure mathematics calculation,
- interconnection [electrical interplay],
- power sharing or power line[power topology],
- layer or multiplayer,
- energy consume & dissipation if innovative
- passive components, storage memory, operational temperature,
- twin in line or formed package,
- layout style pattern(single layer, double or tri layer) in its 3d pattern, device hole, inner lead pitch, base film thickness, material composition.

But style should be taken as a full in creating the determination of original or distinctiveness criteria.

Another gray area is whether or not further or appurtenant functions accessorial in new IC vulnerable to get protection that has got to pass each the check of originality and distinctiveness.

However court ready to distinguish the distinct component supported the claims mentioned within the application at the time of registration.

Power Integrations, Inc., V. Fairchild Semiconductor International, Inc³

Court ascertains the distinctiveness on the basis of various electronic parameters, including, scaling of frequency, variation of *frequency signal* and *soft start circuit* etc. These parameters are based, primarily upon the construction of claim along with their effect in terms of whether

³ MANU/USFD/0486/2013

such frequency variation or other are to be tested in terms of crucials of invention or whether such claims are based upon the prior art, obviousness or are devoid of invention's improvement.

Phillips v. AWH Corp⁴

In this case, court ascertained that the claims are of primary consideration, in order to determine what it is that is patented.

Tate Access Floors, Inc. v. Interface Architectural Res⁵

In this case, court has interpreted the words consisted in a claim in light of the intrinsic evidence of record, including the written description, the drawings, and the prosecution history.

Teleflex, Inc. v. Ficosa N. Am. Corp⁶

In this case, court ascertained that where the intrinsic record is evasive, and whenever required, we have authorized district courts to place reliance upon the extrinsic evidence, that dwells of all the evidence, external to the history of patent as well as the prosecution. Extrinsic evidence includes within its ambit, testimony of the expert and inventor, dictionaries, and learned treatises.

By laying focus upon the above stated judgements and ascertainment of the court we can find that in order to resolve the ambiguity, courts have placed their reliance upon the doctrine of equivalents based on equitable concept in order to refrain infringer from being benefitted by the way of introducing minor changes in invention. In order to establish infringement under the doctrine of equivalents, it is upon the patent holder to prove that the devise of accused consists of limitation of the claim or its equivalent. i.e an element in the product of accused is equivalent to a claim limitation if the variations amongst the two are ethereal to the person having ordinary skill in the art.

III. INDIAN CONTEXT

India being signer of journeys brings therein similar protection to investors & creator, India enforced Semiconductor microcircuit layout Act, 2000 that provides for cover of creator or author of Semiconductor IC layout design. The act is in conformity with the journeys agreement however totally different from U.S. which doesn't offer protection to layout style while not one or a lot of active components appendant to that however affords similar styles of protection with spare chance to try and do reverse engineering for instructional or analysis

⁴ 415 F.3d 1303, 1312 (Fed.Cir. 2005)

⁵ 279 F.3d 1357, 1370 (Fed.Cir. 2002)

⁶ 299 F.3d 1313, 1324 (Fed. Cir. 2002)

purpose, innovation unless it affects the creator rights. equally it provides for assignment, transfer, lease or sell or otherwise styles of rights to creator WHO has place intellectual efforts in conveyance new idea in semiconductor fields⁷.

The tiny particle with the distinctive properties between conductor & stuff particularly semiconductor that is that the foundation of contemporary natural philosophy with distinctive properties application in semiconductor unit & alternative devices with the advancement of technology brings the revolution in the majority fields dominant mobiles, computers & even the quickest missile area unit supported these revolutionary material. The semiconductor & its style being distinct in itself having top quality engineering and involve vast investment demands legal protection too thanks to piracy. The legal provisions guarantee such protection supported originality & distinctiveness by at the same time incorporating provisions for repeating by reverse engineering restricted to sure restriction⁸. The paper tries to contend with the idea of distinctiveness & school of thought of equivalents whether or not such preposition will debar registration.

India heavily depends on semiconductors imports to fulfill business desires. till last decade, 80-90% of semiconductors were foreign from countries like China, Japan, Korea among others. With initiatives like “Make in India”, “Digital India” and alternative efforts by freshly fashioned government, promotion of native semiconductor producing is logical.

If statistics area unit to be believed, it's quite attention-grabbing to notice that semiconductor import has return all the way down to 65-70% throughout year 2014-15. According to Mr. Ashok Chandak, chairman of Indian natural philosophy and semiconductor association (IESA), import could additional return all the way down to five hundredth throughout current year itself.

Prime Minister's recent business tours, to countries like China, Korea, Japan among others that area unit world's leading semiconductor producers has attracted investment value billions to Bharat. With increase in range of corporations that area unit willing to take a position and setup their producing units in Bharat, semiconductor business goes to ascertain “Acche Din”.

Despite ever increasing analysis in natural philosophy and semiconductors business, it's exhausting to swallow the reality that there's very little or zero awareness of SICLD. the actual fact is that the Indian SICLD register remains trying to find 1st soul to file associate application.

⁷ Sec. 18 of *The semiconductor integrated circuits layoutdesign act, 2000*

⁸ <https://www.mondaq.com/india/patent/412662/registration-of-semiconductor-layout-design-an-indian-perspective>

it's so depressing to ascertain that the official gazette printed by SICLD register says "No Application Received" month once month, ever since it had been 1st introduced.

With revival of semiconductor producing in Bharat, it's time the SICLD register conjointly gets revived and makes method for "Acche Din" for itself. The register with support of noted law homes, will guarantee one thing fabulous to draw in layout style applications, making awareness through conferences, workshops, seminars and webinars will merely do wonders. Layout styles hold some unused and unturned potential. Who is aware of it should end up to be best bet among all the intellectual properties throughout years to come back.

Registration Procedure of Semiconductor IC & Layout Design

Any person UN agency ought to get certificate of registration for electronic style or its semiconductor IC ought to file application u/s eight.

1. One should file application for registration to registrar at intervals the territorial limits of principal place of business of human stating name, address & description of owner.
2. Application should states the
 - a) Structure,
 - b) Technique and
 - c) Functionalities of the circuit
 - d) And should vary from alternative registered IC or layout style. but though it accompanies the registered layout style or combination of parts that square measure unremarkably noted among creators of layout style, if taken as an entire it are often thought-about original if it is a results of creator's own intellectual efforts.
3. If the appliance is accepted by registrar however are often rejected on the subsequent grounds namely:
 - i. Originality
 - ii. Commercially exploited
 - iii. Inherently distinctive
 - iv. Distinguishable from alternative registered layout style
4. Once the appliance is accepted, registrar than at intervals fourteen days from the date of advertising cause an equivalent to be publicized .

5. On examination by registrar and with opposition if any at intervals three month from the date of advertising can grant certificate of registration u/s thirteen subject to sure conditions like original, industrial exploitation and distinctiveness.
6. Certificate of registration is valid for ten years from the date of filling of registration or from the date of initial industrial exploration whichever is earlier.
7. Joint authorship in layout style isn't allowable however are often claimed if and given that
 - a. each of the authors have place combined efforts in creation of style or
 - b. Intellectual efforts square measure troublesome to tell apart.
8. Registration give the correct to registered creator of layout style to sue for infringement or damages that otherwise isn't allowable by law regardless of the very fact whether or not the layout style is embedded in article or not.

Owner right to assign or transfer- A registered layout-design shall be negotiable and transmissible whether or not with or while not the goodwill of the business involved.

IV. LEGAL PROVISIONS IN INDIA

The Semiconductor microcircuit Layout-Design Act, 2000, protects original, inherently distinctive layout-designs that haven't been antecedently commercially exploited. Registration could be a necessary pre-requisite for defense. The Semiconductor Integrated Circuits Layout-Design Act, 2000 provides recognition to a replacement variety of material possession, namely, the 'layout-designs' employed in semiconductor integrated circuits as has been outlined u/s 2(h) of the Act.

Exchange of data on a worldwide basis currently will occur instantly as a result of it will be keep therefore promptly and in such quantities in semiconductor integrated circuits or chips as they're unremarkably notable, has comprehensive implications for privacy, negotiation, national security, and defense. Chips area unit usually stated as 'the fossil oil of the knowledge age'.

Background of The Semiconductor Act, 2000

The need for a single variety of protection developed primarily as a results of chip piracy, that vulnerable to undercut the vitality of the semiconductor trade. Chip pirates may sell identical chips for lower costs than may the businesses that originally designed them.

This caused legitimate firms that engaged in chip analysis and development to chop costs to contend with pirated chips, that disadvantaged legitimate firms of the funds required to hold

out more analysis and development to make following generation of chips. Legitimate firms couldn't get adequate chip protection beneath patent, copyright, or secret law, therefore a single variety of protection was provided.

Protection to semiconductor chips was initial given within the U.S.A. through Semiconductor Chip Protection Act (SCPA) in 1984 and its impact was felt nearly throughout the globe. Japan introduced similar protection in 1985, viz., Japanese Circuit Layout Right Act (JCLRA). An Common Market Directive, with implementing legislation altogether Member States of the EU accelerated international efforts leading to the formulation of the 1989 accord on material possession in respect of Integrated Circuits (IPIC Treaty) beneath the auspices of WIPO.

The IPIC accord was later created a part of the journeys Agreement. journeys mixed up adherence to most of the substantive provisions of the IPIC Treaty. As a member of journeys Agreement, Asian country has enacted the Semiconductor microcircuit layout-Design Act, 2000, however it's however to come back into force.

The implementation of the Act comes beneath the Ministry of Communication and InformationTechnology. A layout-design must be registered to receive protection beneath the Act.

Rights under Semi-Conductor and Integrated Circuits Act

- **Junctions:** When doped semiconductors area unit joined to metals, to totally different semiconductors, and to a similar semiconductor with totally different doping, the ensuing junction usually strips the negatron excess or deficiency out from the semiconductor close to the junction. This depletion region is rectifying (only permitting current to flow in one direction), and accustomed more form electrical currents in semiconductor devices.

- **Energetic electrons travel way:** Electrons will be excited across the energy band gap of a semiconductor by numerous means that. These electrons will carry their excess energy over distance scales of microns before dissipating their energy into heat, considerably longer than is feasible in metals. This impact is crucial to the operation of bipolar junction transistors.

- **Light energy conversion:** Electrons in a very semiconductor will absorb light-weight, and afterward retain the energy from the sunshine for an extended enough time to be helpful for manufacturing trade rather than heat. This principle is employed within the solar cell.

Conversely, in sure semiconductors, electrically excited electrons will relax by emitting light-weight rather than manufacturing heat. this is often employed in the sunshine emitting diode and quantum dots.

- **Thermal energy conversion:** Semiconductors area unit smart materials for thermoelectrical coolers and thermoelectrical generators, that convert temperature variations into power and contrariwise. Peltier coolers use semiconductors for this reason.

- **Variable conductivity:** A pure semiconductor could be a poor electrical conductor as a consequence of getting simply the correct range of electrons to fully fill its valence bonds. Through numerous techniques, the semiconductor will be changed to own, far more than electrons (becoming AN n-type semiconductor) or a deficiency of electrons (becoming a p-type semiconductor). In each cases, the semiconductor becomes way more conductive (the physical phenomenon will be exaggerated by one million fold).

Semiconductor devices area unit electronic elements that exploit the electronic properties of semiconductor materials, in the main semiconductor, germanium, and Ga chemical compound, likewise as organic semiconductors.

Semiconductor devices area unit factory-made each as single distinct devices and as integrated circuits (ICs), that incorporates from a number of (as low as two) to billions of devices factory-made and interconnected on one semiconductor substrate, or wafer.

Some samples of such devices are:

- Two-Terminal Device: Diode, Gunn Diode, Schottky Diode, Solar Cell. Zener Diode, light-weight Emitting Diode (LED)
- Three-Terminal Device: Bipolar semiconductor device, IGBT semiconductor device, semiconductor Controlled Rectifier
- Four-Terminal Device: Hall impact (Magnetic Effect) detector
- Multi-Terminal Device: microcircuit (ICs), microchip, RAMs, ROMs.

The semiconductor microcircuit is AN integral a part of each pc chip. The fifth generation computers area unit victimisation terribly massive Scale Integration (VLSI) wherever various transistors area unit accommodated on one chip, thinning out the scale of the chip and at a similar time increasing it's process power considerably. This ultimately interprets into smaller and additional powerful computers. Hence, the event of the layout-design on a semiconductor microcircuit as material possession is sort of important.

The simplest microcircuit consists of 3 layers, one among that is formed from semiconductor material. A wafer (i.e. a thin, extremely polished semiconductor crystal disk) of semiconductor material is coated with a layer of silica (an insulator) and also the electronic elements (for example, transistors) area unit fashioned by a method of diffusion (chemically doping the

semiconductor material with impurities through holes engraved through the oxide).

Finally, an metallic element coating is applied that is part gaseous employing a mask, leaving the interconnections between elements fashioned within the semiconductor layer. it would so be aforesaid that that the knowledge road is paved with semiconductor.

In a complicated circuit, another layer of semiconductor is placed on prime of the engraved wafer, and also the same etching method is recurrent. A chip usually has eight to 12 layers, every layer having a singular mask making the desired circuits. These layers of masks, conjointly referred to as ‘mask work’ or ‘layout-design’, manifest the three-dimensional layout of the chip. it's a chip’s layout or three-dimensional organization that needs protection.

Subject Matter of Protection

The Act affords protection to the layout-design of a semiconductor microcircuit. Protection is given to the layout-design itself in order that style homes manufacturing layout-designs would have protection for those merchandise break away their incorporation in a very chip product.

On the contrary within the USA, a mask work isn't eligible for defense unless and till it's fastened in a very semiconductor chip product. A mask work is ‘fixed’ consistent with Section 901(a)(3) of the SCPA, in a very semiconductor chip product when its embodiment within the product is sufficiently permanent or stable to allow the mask work to be perceived or reproduced from the merchandise for a amount quite impermanent period.

Thus, a mask work can commonly be fastened in a very semiconductor chip product once the primary product has been factory-made.

But beneath Article 2(ii) of the IPIC accord, ‘layout-design has been outlined as the three-dimensional disposition, but expressed, of the weather, a minimum of one among that is an energetic part, and of some or all of the interconnections of an microcircuit,or such a three-dimensional disposition ready for AN microcircuit supposed for manufacture. Thus, from this too, it becomes clear that there exists no would like for the planning to own been enforced in physical type because the words “or such a three-dimensional disposition ready for, microcircuit supposed for manufacture” are enclosed within the definition.

Similar intention will be imputed to the Indian legislative assembly whereas it absolutely was drafting the Act.

The explanation to Section seventeen additionally lays down that the correct bestowed by the registration of a layout-design shall be out there to the registered owner regardless of the actual fact whether or not the layout-design is incorporated in an editorial or not.

Moreover, Asian country could be a member of the journeys Agreement that itself obliges adherence to Article a pair of through seven of the IPIC accord.

This proposition gathers force from the actual fact that there area unit specialist style homes that prepare the layout-design of AN application-specific microcircuit (ASIC) for a client, the topography being enforced in a very separate semiconductor mill. Clearly, it's necessary for the layout-design to be protected at this stage, and not simply once its implementation in a very semiconductor chip product.

Protection beneath the Act exists solely once the layout-design has been registered. Layout-designs will be registered, if they are:

- original,
- inherently distinctive,
- capable of being distinguishable from the other registered layout-design and
- if they need not been commercially exploited for quite 2 years before date of application for registration.

Thus, the Act doesn't need ‘novelty’ however ‘distinctiveness’ for the aim of registration. A layout-design usually consists of a mix of components and interconnections that area unit unremarkably notable among creators of layout-designs and makers of semiconductor integrated circuits and therefore area unit thought-about original provided that such combination taken as an entire is that the results of its creator’s own intellectual efforts.

Thus, the Act has recognized that layout-designs can typically contain style components already existing or protected within the semiconductor trade that is a very important issue for semiconductor layout-designs as they're, within the overwhelming majority of cases, new compilations of well-known commonplace components. The Act needs ‘creator’s own intellectual effort’ and additionally lays down that such styles mustn’t be commonplace among the creators of layout styles and makers.

This may be shown by the initial combination of components of style that don't seem to be by themselves original.

Thus, a replacement topography is also the results of a mix of commonplace components, that haven't been combined in just a similar manner as before. Also, the possibilities area unit that ANy new styleed layout-design that isn't merely a duplicate of an existing design can have a minimum of some options or combination of options that area unit dissimilar to options already well-known in respect of semiconductor merchandise.

*Ocular Sciences Ltd v. Aspect Vision Care Ltd.*⁹

In this case attempt was made to ascertain the meaning of commonplace. Mr. Justice recognized that the word commonplace isn't one antecedently employed in UK law however derives from the E C Directive on the legal protection of semiconductor topographies.

Whilst not desperate to paraphrase a word employed in a statute, boy J like counsel's submission that any style that is 'trite, trivial, common-or-garden, commonplace or of the sort which might excite no explicit attention in those within the relevant art is probably going to be commonplace'.

However, and in line with the semiconductor Directive, he confirmed that a style, that is formed from variety of such options, needn't essentially itself be commonplace. for defense, the mix should itself not be commonplace and this might be thus notwithstanding the constituent elements are trivial or mundane.

The need to point out 'intellectual effort' may be tough given the employment of layout-design, and also the incontrovertible fact that the principles of collection the weather of a layout-design ar fairly well established, yet the hassle concerned in doing thus may be substantial.

Therefore, this originality demand is stronger than the originality needed underneath the Copyright Act however weaker than the novelty demand underneath the Patents Act. These ar written on the lines of Article 3(2)(a) and (b) of the IPIC accord.

The second demand is that it should be inherently distinctive or inherently capable of being distinguished from the other registered layout-design.

These terms though a similar as showing within the Trade Marks Act, 1999, have completely different meanings. It should by its terribly nature show a discrepancy from alternative registered styles. Probable tests of inherent distinctiveness might be:

- The operate performed by the layout-design is new and completely different from that performed by alternative layout-designs. this could build the layout-design distinct in itself notwithstanding it happens to contain some well-known style parts.
- Elements/substances employed in the manufacture of the layout-design ar novel within the trade, as an example, sure new alloys.

This demand of inherent distinctiveness is found within the Indian Act solely, no mention of a similar being found in any previous Act on semiconductor layout-design elsewhere or for that

⁹ [1997] RPC 293

matter within the IPIC accord or visits Agreement.

The third demand is with relation to business exploitation. Any act of leasing, selling, offering/exhibiting available, a layout-design for any business purpose amounts to business exploitation. Distributing a layout-design for business functions (and not essentially for financial gain) too amounts to business exploitation.

Thus, the key take a look at is that the activity should be for a billboard purpose. If a someone was too distribute a tube-light electronic ballast created by him, incorporating a brand new original layout-design (which allows the tube-light to change on while not blinking, as quick as a bulb, and conjointly operate at terribly low voltages), to fellow colleagues for private use, it'd not quantity to business exploitation. however ifhe were to sell it as a brand new product developed by him, it'd quantity to business exploitation.

Protection underneath the Act extends for 10 years, that is in line with Article 38(1) of the visits Agreement. underneath the Indian Act, it commences from the date of application for registration just in case of layout designs, that haven't been commercially exploited.

For layout-designs that are commercially exploited, that's for fewer than 2 years before the date of application for registration, protection commences retrospectively from date of the primary business exploitation. Yet no matter once the duration of protection is calculated from, rights will been forced solely when registration.

Thus, if a chip was released within the marketplace for business exploitation in March 2001 and registered in Oct 2002, protection would start from March 2001 for a period of 10 years i.e. upto March 2011. Upon registration, the owner is, however, entitled to claim damages not just for the infringement of his rights that occurred when Oct 2002 however conjointly for infringement that occurred from March 2001.

V. EXCLUSIVE RIGHTS PROVIDED

The registered-proprietor has the right to breed by any means that the registered layout-design or any substantial portion of it. However, there's one vital exception to the current right. any individual could reproduce the layout-design "for the needs of scientific analysis, analysis, analysis or teaching. This can be like the honest dealing exception in copyright law. The Act conjointly permits persons to 'reverse-engineer' layout-designs for the aim of analysing the layout-designs and incorporating the insights of their analysis into a creative layout-design of their own. Such a provision is taken into account to be even, in accordance with Article 6(2)(b) of the IPIC accord and also the provisions within the visits Agreement, as

there's a requirement to encourage creativeness through the development of existing layout-designs. Moreover, to with success enter Associate in Nursing computer circuit market phase with a brand new product, the new entry should typically be compatible with established merchandise¹⁰.

However, the data required to realize compatibility is commonly not publically accessible. Thus, aspiring competitors should gather this data in a different way. However, they have to do thus while not infringing layout-design rights underneath the Act. In process acceptable reverse engineering, lawmakers tried to balance the necessity for safeguarding investments in layout-designs with the pro-competition sentiment.

The reverse engineering limitations on protection in the United States SCPA are found in Section 906(a), (1) and(2); in Article 12(2) of the JCLRA and in regulation8(4) of the united kingdom Design Right (Semiconductor)Regulations 1989.

Brooktree Corporation v. Advanced Micro Devices¹¹

The America Court of Appeals for the Federal Circuit has ascertained that a paper path does not completely prove a reverse engineering defence beneath the SCPA. The Court explained that the statute doesn't excuse repeating wherever the alleged infringer initial tried and did not reverse engineer a chip layout while not repeating.

The Court rejected the claim that the reverse engineering defence is established by the sheer volume of paper, inform that the written account is proof of freelance effort however not incontrovertible proof of either originality of the top product or the absence of repeating.

The registered-proprietor additionally has the prerogative to import, sell or distribute for business purpose any semiconductor chip product during which the registered layout-design is embodied.

Thus, the rights beneath the Act extend not solely to the registered layout-design or chips containing such registered layout-designs, however additionally over product containing such chips, e.g. a watch or cell-phone.

Enforcement of Exclusive Rights

The Act expressly lays down provisions affording criminal remedies for the infringement of a layout style. however the Act doesn't offer expressly for civil remedies as in alternative IP laws nor will it bar these remedies. It just refers to 'damages' in Section sixteen that says: 'no person

¹⁰ https://semengineering.com/knowledge_centers/intellectual-property/

¹¹ 977 F.2d 1555

shall be entitled to institute any continuing to forestall, or to recover damages for, the infringement of associate unregistered layout-design'.

Thus, it will safely be aforementioned that the civil remedies, like injunctions, the account of profits and damages would be applicable to enforce rights with regard to layout-designs additionally, as within the case of patents, copyright etc. Although, it might be preferred if additional categorical provision to the current extent had been incorporated inside the Act.

Unlike the law of patents and styles in Bharat additionally as alternative international instruments for the protection of semiconductor topographies, the registered businessman has criminal remedies for the infringement of a layout-design.

Thus, whoever wittingly or willfully infringes a layout-design shall be punishable with imprisonment up to 3 years and/or a fine between fifty thousand and 10 large integer rupees. just in case of infringement, the registered-proprietor is needed to submit a written grievance to the Court of Judicial adjudicator first-class, which might take cognizance of this offence. The court could order forfeiture to the govt of products associated with the offence, and also the same is also destroyed just in case of a conviction.

Again, the Indian Act is distinctive from the prevailing laws on semiconductor protection.

The quality of providing for criminal sanctions for intentional acts of infringement lies within the indisputable fact that the bar of infringement of layout-design rights is within the public interest. Criminal sanctions area unit typically an efficient deterrent. The Act exempts from liability innocent purchasers of infringing chip product with regard to the importation or distribution of these product before they had notice of the layout-design protection.

It also allows innocent purchasers WHO receive notice of infringement, to import or distribute infringing chip product purchased before they'd notice, provided they pay the businessman of the registered layout-design an inexpensive royalty. Assignment, Transmission And Registered Users

A registered layout-design is appointed or transmitted whether or not with or while not the goodwill ofthe business involved. associate assignment of a layout style should be created in writing by the registered businessman. No specific type has been prescribed.

Transmission means that transmission by operation of law, devolution on the private representative of a individual associated the other mode of transfer not being an assignment. The law about the transmission of a layout-design is that the same as that for assignment.

In the case of associate assignment of a layout-design, while not the goodwill of the business, the assignment won't surface unless the party advertises the assignment in newspapers in accordance with the directions of the Registrar, given on application created for the aim. Registration of assignment or transmission is important to determine title to the registered layout-design.

The Act additionally provides for the registration of third parties as registered users of the registered layout design. For this purpose, the registered-proprietor associated the planned user should build a joint application in writing to the Registrar amid an agreement in writing, testimony created by the businessman giving details of the degree of management by the businessman, place of permitted use, period of use, etc. Registration as registered user is granted as long as the registered proprietor will exercise correct management over the employment of the layout-design by the registered user. The registered user contains a right to use the registered layout-design subject to the conditions and restrictions entered on the register.

He could also institute infringement proceedings in certain circumstances. however the proper to use isn't an assignable or transmissible right. The permissible use by the registered user is deemed to be utilized by the registered businessman. The registered user entry perhaps off by the Registrar on associate application made by the registered-proprietor or the registered user, or any alternative registered user of the layout-design.

It is vital to notice that the Act permits the exploitation of a protected layout-design, while not the agreement of the registered-proprietor, by the govt or by third persons approved by the govt, publically interest (for non-commercial public functions or for the needs relating to national emergency or of utmost public urgency) or remedy associate anti-competitive apply.

The Government could exploit the protected layout-design while not the agreement of the registered-proprietor to whom associate adequate remuneration would be paid. as an example, if the state is engaged in war and needs the employment of a selected integrated-circuit to incorporate into its latest long vary earth-to-earth missile, however this integrated-circuit consists of a protected layout design.

Then the choices accessible to the Government are to enter into associate agreement with the registered proprietor of such registered layout-design, on commercial terms, for the permissible use of the layout style, or to approach the legal proceeding Board to allow required usage.

Crux of the Indian Legislation¹²

- There is that the protection of semiconductor integrated circuits layout and styles by a registration method.
- There may be a mechanism for identifying that layout styles is protected.
- There area unit rules to ban registration of layout styles that aren't original or that are commercially exploited.
- Protection of ten years amount is provided to layout styles.
- Provisions relating to infringement and proof of validity area unit mentioned.
- There area unit provisions for decisive payment of royalty for registered layout styles just in case of innocent or unintentional infringement.
- Penalties within the type of imprisonment and fine area unit obligatory for intentional infringement and alternative offences within the Act.
- The Registrar is appointed for the aim of administration and also the legal proceeding Board is established for facilitating the legal objective.

VI. COVID-19 IMPACT ON THE GLOBAL SEMICONDUCTOR IP MARKET

The semiconductor information science market includes key firms like Arm Holdings, Synopsys, Cadence, CEVA, Imagination Technologies, Rambus, e-Memory, Mentor Graphics, and Lattice Semiconductor. These firms have their style and fabrication facilities and company offices unfold across numerous countries across Asia Pacific, Europe, Americas, and RoW. The semiconductor information science solutions designed by these firms square measure accredited by many industries for numerous applications. COVID-19 not solely compact the operations of the varied semiconductor firms, however additionally affected the companies of their partners and distributor.

The slow demand for client natural philosophy and alternative embedded devices thanks to internment measures had a world impact on the market. the autumn within the international demand and export shipments for automotive vehicles as compared to pre COVID-19 levels is additionally expected to negatively impact the automotive parts market and eventually, stagnant the demand for semiconductor information science .

The recent COVID-19 pandemic is anticipated to slightly impact the worldwide semiconductor

¹²<https://www.lawctopus.com/academike/rights-semiconductor-act-2000/>

information science trade.

The complete provide chain got non-continuous, thanks to restricted provide of elements throughout the primary quarter of 2020. Eg, the natural event of COVID-19 in China resulted in internment measures including the closedown of producing facilities and warehouses and affected the worldwide exports and shipments of assorted industries¹³.

The internment measures declared in many countries across the world as they got compact by the COVID-19 pandemic additionally diode to a fall within the domestic and export demand for client natural philosophy, automotive vehicles, and alternative industrial instrumentation and embedded devices in these countries.

VII. SEMICONDUCTOR INFORMATION SCIENCE MARKET DYNAMICS DRIVER

Growing adoption of connected devices for daily use Connected devices square measure connected to alternative devices or networks through numerous communication protocols, like NFC, Wi-Fi, and Bluetooth.

These devices square measure equipped with good transmitters and receivers that sense relevant signals and consequently send data on demand. Over the past 3 years, semiconductor players have joined forces with hardware, networking, and package firms, yet like many trade associations and tutorial consortia to develop formal and informal standards for IoT applications.

There has been associate increasing adoption of connected devices, like smartphones, wearables, connected vehicles, and good home systems for daily use over the past few years. The combination of power natural philosophy in these devices is anticipated to fuel the expansion of the semiconductor information science market across the world. The demand for top performance with lower power consumption capabilities can more intensify the market demand within the future.

Restraint

Constant changes in technology. Change in nodes of a semiconductor chip changes style quality, chip kind issue, and information science core style design. Restraint in advanced SoC style is that the effective implementation of those chips in advanced technologies, like twenty nm plate like and Fin FET processes. Migration to a sophisticated technology node will increase style value for information science vendors, whereas payments for licensing the

¹³ <https://www.marketsandmarkets.com/Market-Reports/semiconductor-silicon-intellectual-property-ip-market-651.html>

information science appropriate as per the new technology node might not match up to the increase in expenditure.

Opportunity

Prospects for the semiconductor information science market due to demand from astronautics and region & defense industries. The astronautics and region & defense industries square measure more and more turning into captivated with extremely subtle, complicated electronic systems. In these industries, the demand for electronic and semiconductor hardware parts is rising, that has generated the necessity for associate innovative style resolution for chip producing. the necessity of advanced and extremely complicated semiconductor technology for astronautics and region and defense applications additionally poses unequaled challenges for semiconductor chip makers.

Programmable chip platforms square measure quickly being incorporated to deal with the stress for brand spanking new and rising astronautics and region and defense applications. Some necessities square measure superior processing performance, hard-coded semiconductor information parts for embedded processing, DSP, and tremendous-speed and long-range signal property. of these factors may provide growth opportunities for the semiconductor information science market.

Challenges

Impact of information science thefts, counterfeits, and conflicts on the semiconductor information science market. Major issues featured by the semiconductor information science trade square measure information science thefts, counterfeits, and conflicts; the impact of those issues has augmented over the past few years. Another major facet that makes a significant drawback and fuels information science thefts, counterfeits, conflicts, and piracy is that the shadow semiconductor provide chain.

The counterfeit semiconductor chip provide chain, involving pirated semiconductor information science, is additional harmful to the worldwide semiconductor trade and suppliers, intermediaries, and customers. information science counterfeiting, notably as well as the event of counterfeit parts and system-level styles of information science cores, is that the major economic threat to current business models followed worldwide.

Memory information science section is anticipated to register the best CAGR throughout the forecast amount Memory information science section is anticipated to register the best CAGR throughout the forecast amount advisedly information science.

The speedy increase of media streaming and social networking content these days has sharply augmented storage demand regionally and inside knowledge centers.

This has forced IC designers to use memory IPs to style economical storage and process devices. Moreover, the presence of many kinds of memory ICs within the market, like flash-memory, IC technology, and random-access memory, effaceable programming memory, and programmable read-only storage, has diode to their use across a large vary of applications. These factors square measure expected to drive the expansion of the memory information science market globally. Royalty section to account for the biggest market share of semiconductor information science in terms useful in 2025.

The royalty section is anticipated to be the biggest marketplace for semiconductor information science by volume in 2025, by information science supply. The marketplace for royalty is flourishing thanks to the speedy changes in technologies wherever makers will manufacture as several merchandise as they need and pay a royalty for under those merchandise.

The royalty sourcing model is more and more turning into common within the semiconductor trade as a result of the designers square measure trying to attenuate their up-front prices. It additionally permits semiconductor information science suppliers with the good thing about enjoying long rewards related to the sure-fire performance of the tip product within the market. Soft core section for semiconductor information science is anticipated to witness higher CAGR growth throughout the forecast amount.

The soft core section of the semiconductor information science market is anticipated to register higher CAGR growth throughout the forecast amount by information science core. The demand for soft information science core is growing thanks to its high affordability as a results of low value or freed from value sourcing of information science style thanks to simple and versatile implementation. Moreover, the soft information science cores square measure comparatively simple to implement on specific architectures when put next to hardcore information science. These factors have boosted the market growth of soppy information science core, globally, in numerous industries.

VIII. RECENT DEVELOPMENTS

- In Gregorian calendar month 2020, Imagination Technologies launched IMG iEW400, the newest information science supported Ensigma Wi-Fi technology. This new information science delivers integrated RF and baseband from one supply, designed for low-power and powered applications like the net of things (IoT), wearables, and hearables.

- In could 2020, Arm launched a brand new vary of processor information science to reinforce succeeding generation smartphone expertise for the 5G era. These embody the Arm Cortex-A78 computer hardware, Arm Mali-G78 GPU, and also the Arm Ethos-N78 NPU. These new Arm information science works on new machine learning capability and guarantees a twenty fifth improvement in performance potency.
- In March 2020, Cadence collaborates with STMicroelectronics (Switzerland), a number one manufacturer of semiconductor instrumentation, to style a 56G-VSR SerDes for associate SoC targeted for the networking, cloud, and knowledge center markets. The collaboration is anticipated to strengthen Cadence's SoC style excellence.
- In February 2020, Synopsys launched a brand new DesignWare ARC communications information science scheme for wireless narrowband IoT styles. The new ARC EM11D processor has virtually zero latency and quickly adapts to quickly dynamic wireless standards.
- In Gregorian calendar month 2018, CEVA developed the successor to its fashionable CEVA-Dragonfly NB1 resolution named CEVA-Dragonfly NB2. it's a extremely integrated and standard resolution optimized for Cat-NB2 (3GPP unleash fourteen eNB-IoT) that may seamlessly be incorporated into chips and modules by the multitude of firms trying to deal with the big and invasive cellular IoT house¹⁴.

IX. CONCLUSION

The act provides the legal protection each to layout style further as semiconductor computer circuit. The act is in conformity with journeys however completely different from North American nation act that provides protection given that the mask work has atleast one active component hooked up or in alternative words North American nation law provides protection if the chip work produces some quite issue rather than being in paper solely.

This multi-billion dollar trade desires protection however, wherever corporations show reluctance in returning to courts if circuits have similar formalities could also be as a result of act themselves give reverse engineering for repeating and remake of circuit on the bottom of innovation. in contrast to alternative information processing product like patent or trademark or perhaps copyright, semiconductor layout or style don't sustain for extended time thanks to quick modification in technology, wherever though one company build innovative semiconductor product another company come back up with even much better and replace such in few days.

The enactment of this Act fulfils India's obligations below the journeys Agreement because the Act

¹⁴ <https://www.marketsandmarkets.com/Market-Reports/semiconductor-silicon-intellectual-property-ip-market-651.html>

fulfils the journeys norms.

This Government initiative to guard integrated circuits can build confidence within the trade and therefore the world finance community. The Act compares well with overseas enactments altogether necessary aspects, from time to time going additional even, as an example, the need of inherent distinctiveness and provision of criminal remedies for infringement.

The information processing regime in India before this Act failed to absolutely cater to the wants of this specialty space departure a chip developer with deficient protection for his work. Recognition of layout-designs for *sui generis* protection can go an extended manner in benefiting the trade further because the shoppers of chip product by attracting additional players within the chip trade and maintaining healthy competition between them, that successively interprets into additional competitive rating. India in itself is slowly rising as a vital player within the multi billion dollar world semiconductor trade.

Indian corporations nowadays square measure claiming to try to to substantial project add the realm of chip style and have their targets set at creating India the planning powerhouse of the globe. But India being a developing country, sizeable foresight and coming up with square measure needed by the govt to institute the correct policies. journeys obliges a high level of information processing protection, that ought to guarantee a secure legal atmosphere to encourage such innovative activity.

India heavily depends on semiconductors imports to fulfill trade desires. Till last decade, 80-90% of semiconductors were foreign from countries like China, Japan, Choson among others. With initiatives like “Make in India”, “Digital India” and alternative efforts by freshly shaped government, promotion of native semiconductor producing is logical. If statistics square measure to be believed, it's quite attention-grabbing to notice that semiconductor import has come back right down to 65-70% throughout year 2014-15. in step with man.

Ashok Chandak, chairman of Indian natural philosophy and semiconductor association (IESA), import could additional come back right down to five hundredth throughout current year itself. Prime Minister's recent business tours, to countries like China, Korea, Japan among others that square measure world's leading semiconductor producers has attracted investment value billions to India. With increase in range of corporations that square measure willing to take a position and setup their producing units in India, semiconductor trade goes to ascertain “Acche Din”.

Despite ever increasing analysis in natural philosophy and semiconductors trade, it's laborious to swallow the reality that there's very little or zero awareness of SICLD.

The very fact is that the Indian SICLD register remains trying to find 1st applier to file AN application. it's so depressing to ascertain that the official gazette printed by SICLD register says “No Application Received” month when month, ever since it absolutely was 1st introduced.

With revival of semiconductor producing in India, it's time the SICLD register additionally gets revived and makes manner for “Acche Din” for itself. The register with support of famed

law homes, will guarantee one thing fabulous to draw in layout style applications. making awareness through conferences, workshops, seminars and webinars will merely do wonders. Layout styles hold some unused and right-side-out potential. Who is aware of it should end up to be best bet among all the intellectual properties throughout years to return
