

# Identifying the Gray Zone between Bootleg and Counterfeit in the Context of Integrated Circuit Piracy in Indonesia

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## Abstract

Counterfeit integrated circuit (IC) products have been traded illegally in Indonesia due to a lack of public awareness of intellectual property rights (IPR) and inconsistent law enforcement. Irresponsible parties have produced fake ICs in the form of imitation goods, illegally imported from China to Indonesia—an issue that appears to be a further implication of the global technological trade

war. Due to prohibited modifications, a gray zone exists between the classification of bootleg and counterfeit products, even though both are fake. Bootlegs are “inspired-products” protected by registered brands and industrial designs, which makes them more challenging to investigate than counterfeits that directly replicate the original. As a result, the proof aspects differ. It is essential to differentiate between counterfeits or bootlegs to enforce the appropriate sanctions and protect ICs in Indonesia. Using a normative research method, this legal research analyzes the differentiation between bootleg and counterfeit ICs and the legal protection of integrated circuits in Indonesia through statutory and conceptual approaches. This paper recommends the urgent need for a definitive classification to facilitate proof and the imposition of sanctions. Furthermore, the Indonesian government should revise Law No. 32 of 2000 by adding regulations regarding priority rights, enabling foreign IC rights holders to be better protected in Indonesia. Law enforcement efforts against counterfeit and bootleg ICs must also be supported by Indonesia’s commitment to participate in the Anti-Counterfeiting Trade Agreement.

**KEYWORDS** *integrated circuits, piracy, VGA, bootleg, counterfeit*

## Introduction

An integrated circuit is a product in finished or semi-finished form that contains various elements, including at least one active element, which are interconnected and formed in an integrated manner within a semiconductor material to produce electronic functions.<sup>1</sup> To assemble and build a personal computer (PC), users require integrated circuit (IC) products such as video graphics array (VGA) or graphics cards, which are pivotal examples of integrated circuit.<sup>2</sup> Nvidia, AMD, and Matrox are among the world's largest manufacturers of graphics cards, and their products are frequently counterfeited or bootlegged in the Indonesia market.<sup>3</sup>

The distribution of fake IC products—including both counterfeit and bootleg varieties—has become increasingly complex,

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<sup>1</sup> Article 1 Law No. 32 of 2000 on Layout Designs of Integrated Circuits.

<sup>2</sup> Zimo Li, “Analysis Of the Development History, Key Technologies, And Future Development of Integrated Circuits,” *Highlights in Science, Engineering and Technology* 81 (2024): 313–17, <https://doi.org/10.54097/bbqvc047>.

<sup>3</sup> Jon Peddie, *The History of the GPU - Eras and Environment* (Heidelberg: Springer International Publishing, 2022), <https://doi.org/10.1007/978-3-031-13581-1>.

particularly in relation to IPR violations. Even though both are classified fake, they differ in specifications, and therefore the burden of proof was also different. This distinction creates ambiguity between what is classified as a counterfeit product and a bootleg product. In the beginning, both violate the original product's rights, creating a gray zone in proving the element of counterfeiting between original and bootleg products. Bootleg ICs are "inspired-products" with different brands and industrial designs that may appear original at first glance. However, upon inspection, their internal components often imitate the ICs of other registered products. This paper further analyzes how bootleg ICs, despite copying original products, are modified and rebranded to conceal their origins. Therefore, proving counterfeit products and imposing criminal sanctions is more straightforward than addressing bootlegs.

A VGA or graphics card is typically expensive due to high production and research costs. Graphics processing units (GPUs) are produced by three leading global vendors: AMD, Intel, and Nvidia. Different GPUs have different compatibility, power, evaluation metrics, and efficiency inference,<sup>4</sup> and therefore manufacturers endeavor to expand competitive performance while lowering initial costs and power consumption. The rising prices of VGA cards from ASUS, Intel, and Nvidia have also been influenced by the increasing global trend in Bitcoin prices since 2017. Consequently, consumers demand high-spec computers for cryptocurrency mining, not only for corporate and entertainment purposes.<sup>5</sup> Consumer-grade GPUs were once an affordable and energy-efficient alternative to enterprise-class hardware for real-time image processing tasks using machine learning.

In the semiconductor industry, high performance comes with high power requirements. It is therefore crucial for companies to achieve high-returns and sell products at premium prices<sup>6</sup> through

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<sup>4</sup> Yuhuan Huang et al, "Intelligence Evaluating Computational Power: A Multi-Factor Method," *IEEE Access* 13 (2025): 27398–415, <https://doi.org/10.1109/ACCESS.2025.3538977>.

<sup>5</sup> Sainathan Ganesh Iyer dan Anurag Dipakumar Pawar, "GPU and CPU Accelerated Mining of Cryptocurrencies and their Financial Analysis," *2018 2nd International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC)I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC)*, 2018 2nd International Conference on, IEEE, (2018):599–604, <https://doi.org/10.1109/I-SMAC.2018.8653733>.

<sup>6</sup> John Wang et al, "A Comprehensive Analysis of Nvidia's Technological Innovations, Market Strategies, and Future Prospects;" *International Journal of Information Technologies and Systems Approach* 17, no. 1 (2024):1–16, <https://doi.org/10.4018/IJITSA.344423>.

diversified semiconductor systems and software as integrating products. The price increase recurred in 2021, when Bitcoin surged to a new record high before declining steadily.<sup>7</sup> The challenge posed by premium pricing lies in consumers' willingness to pay. The sustainability of competitive advantage for ASUS, Intel, and Nvidia depends heavily on artificial intelligence (AI). Moreover, following the global transition into the era of Digital Society 5.0, AI has become integral to daily life. The use of AI in various technology products—by both corporations and individuals—requires capable VGA cards, especially in China. Impulsive purchases of VGA cards have led to stock shortages and high demand, causing consumers to prioritize short-term functionality and affordability over product authenticity. VGA piracy, involving the modification of fake components, began globally in 2009, according to surveys conducted by the Electronic Resellers Association International (ERAI) Inc. and the Government-Industry Data Exchange Program (GIDEP). Most piracy reports originated from aerospace electronics companies, rather than entertainment-focused industries, such as gaming.<sup>8</sup>

As a fraudulent activity that produces fake units, piracy threatens global competition and economic growth. Counterfeit IC products undermine corporate innovation and affect intellectual property rights (IPR) as intangible assets. Additionally, counterfeit spare parts and components pose significant risks to the technology supply chain, harming both the global economy and national security.<sup>9</sup> Import of fake VGA cards—both counterfeit and second-hand—from China to Indonesia occurs due to weak government control. To protect integrated circuits in Indonesia, legal safeguards must be enforced against counterfeit and bootleg VGA manufacturers. Therefore, it is essential to differentiate between imitation and counterfeit goods, which are classified as either counterfeits or bootlegs. This research offers a high state-of-the-art value, as it is the first legal study to address the protection of

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<sup>7</sup> Siyu Yang, Kun Liu, "Nvidia and Bitcoin Linkage Study—Based on DCC-GARCH Model," *Financial Engineering and Risk Management* 6, no. 8 (2023), <https://doi.org/10.23977/ferm.2023.060811>.

<sup>8</sup> Mark Tehranipoor et al, *Counterfeit Integrated Circuits: Detection and Avoidance*. (London: Springer International Publishing, 2015), <https://doi.org/10.1007/978-3-319-11824-6>.

<sup>9</sup> Samar Saleh et al, "A Survey on Counterfeits in the Information and Communications Technology (ICT) Supply Chain", *Proceedings of Seventh International Congress on Information and Communication Technology*. Springer Nature Singapore, 2023, [https://doi.org/10.1007/978-981-19-1607-6\\_75](https://doi.org/10.1007/978-981-19-1607-6_75).

integrated circuits in relation to bootleg and counterfeit products, with a specific focus on VGA cards. The legal dimension of integrated circuits in this research are informed by research from the past five years, including an article by Rama et al., which discusses the main attributes and subattributes of trustworthy integrated circuits.<sup>10</sup> However, that discussion centers on technological aspects rather than specific legal regulations. Additionally, articles by Bintang<sup>11</sup> and Siahaan<sup>12</sup>—both published in Indonesian journals—offer general, dogmatic-level analyses of the regulatory framework for integrated circuit rights in Indonesia.

This research discusses the legal protection provided by the Indonesian government for imports of counterfeit electronic goods—especially conductors, semi-conductors, and VGA cards—from Asia and Europe. Such protection remains weak, from licensing procedures to supervision. These imported products violate import policies and IPR, especially the rights related to the layout design of integrated circuits. The government's failure to penalize violations of layout design rights reflects its lack of commitment to implementing the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) and the Washington Treaty. This commitment involves not only ratifying TRIPS in regulatory preparation but also enforcing those regulations in practice. This research examines the differentiation between bootleg and counterfeit VGA cards in the context of integrated circuits and the legal protection of ICs in Indonesia.

## Methodology

The methods used in this legal research included statutory and conceptual approaches. The statutory approach involved reviewing regulations concerning integrated circuits and IPR in Indonesia—specifically, Law No. 32 of 2000 on Layout Designs of Integrated Circuits—and observing several international trade

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<sup>10</sup> Enkele Rama et al, "Trustworthy Integrated Circuits: From Safety to Security and Beyond," *IEEE Access* 12 (2024): 69603–32, <https://doi.org/10.1109/ACCESS.2024.3400685>.

<sup>11</sup> Sanusi Bintang, "Desain Tata Letak Sirkuit Terpadu sebagai Hak Kekayaan Intelektual dalam Hukum Indonesia," *Kanun Jurnal Ilmu Hukum* 20, no. 1 (2018): 23–38, <https://doi.org/10.24815/kanun.v20i1.9897>.

<sup>12</sup> Frenchelse Gorga Siahaan, "Efektivitas Pemberlakuan Undang-Undang Nomor 32 Tahun 2000 tentang Desain Tata Letak Sirkuit Terpadu di Negara Indonesia," *JISIP (Jurnal Ilmu Sosial dan Pendidikan)* 6, no. 3 (2022), <https://doi.org/10.58258/jisip.v6i3.3355>.

agreements, such as the ASEAN-China Free Trade Area (ACFTA), TRIPS, and Washington Treaty (IPIC 1989). The conceptual approach identifies doctrines and legal principles on IPR and counterfeit products from books and journals. This study utilized qualitative analysis to examine regulations, literature, and periodicals on integrated circuit protection, especially VGA piracy, to identify the distinction between bootleg and counterfeit products and determine the appropriate legal protections to be implemented in Indonesia.

## Result and Discussion

### A. Differentiation Characteristics between Bootleg and Counterfeit ICs

Indonesia has official representatives or vendor branches for IC products, such as conductors and VGA cards, but they cannot accommodate all consumer demands. To satisfy market needs, traders continue to import VGA cards from abroad. However, original products are subject to import taxes calculated not only by quantity, weight, and shipping costs but also by authenticity. These taxes are often high. As a result, irresponsible parties, especially China, produce counterfeit VGA cards as the cheapest but highest-risk option, and bootleg VGA cards as a lower-risk but more expensive alternative. Consumers who require large quantities of VGA cards at low prices may overlook product authenticity. This not only affect device durability but also contributes to widespread IPR violations and demonstrates the Indonesian government's noncompliance with its commitment to enforce IPR laws, especially since the ratification of TRIPS and its obligations under World Trade Organization (WTO) agreements.

Violations of integrated circuit rights in bootleg and counterfeit VGA card products are multi-dimensional. Manufacturers of counterfeit items deliberately replicate authentic products that are registered and certified under IPR, then sell them as genuine to deceive consumers.<sup>13</sup> This differs from bootleg products, which have no intention of marketing themselves as counterfeit goods but instead creatively imitate existing products to produce new goods under distinct trademarks. This practice is common in China and India. For example, while Apple products are mostly manufactured in

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<sup>13</sup> Xuemei Bian et al, "New Insights into Unethical Counterfeit Consumption," *Journal of Business Research* 69, no. 10 (2016): 4249–58, <https://doi.org/10.1016/j.jbusres.2016.02.038>.

China, fake versions are also produced in the U.S. and India. India's electronic industry does not manufacture electronic components independently but imports them from China and Indonesia. Original products are often mixed with counterfeit and bootleg items, compromising consumer safety, national economy, and brand integrity<sup>14</sup>, not only in India but also the U.S. and China.<sup>15</sup> Bootlegging is a practice of imitating the design and layout of a circuit—not through complete replication but partial imitation—then modifying it to resemble the original in terms of the basic idea, benefits, and form. Nonetheless, both bootleg and counterfeit practices violate IPR laws. The Organization for Economic Co-operation and Development (OECD) lists China and India among the countries most frequently associated with fake goods.<sup>16</sup> This has a further impact on the electronics market in Indonesia, which serves as a third-country destination for products from both the U.S. and China.

In Indonesia, Law No. 32 of 2000 does not classify fake integrated circuits into distinct categories. The law does not even recognize the existence of bootlegs, making such identification important for future regulatory revisions. Bootlegs can occur across various IPR domains, from products to industrial designs, and includes layout designs of integrated circuits. Both imported and domestically produced VGA cards in Indonesia have been infiltrated by bootleg products. Layout design for integrated circuits are never free from bootlegging, including VGA cards, oscillators, and motherboards.<sup>17</sup>

Copycat companies typically acquire designs through three methods: leaking information from semiconductor subcontractors, purchasing illegally from third parties, or hijacking by forcibly dismantling IC units. Copying a circuit board that incorporates a custom IC requires advanced engineering based on confidential company data. These companies often cannot obtain the same specialized chips as the originals. However, they may replace unique

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<sup>14</sup> Sanjana Duggineini, "Counterfeiting in India: How to Combat it?," *Indian Journal of Law and Legal Research* V, no. 2 (2023), <https://www.ijllr.com/post/counterfeiting-in-india-how-to-combat-it>.

<sup>15</sup> Sps Shekhawat, Tarushi Gaur, "The Role of AI in Detecting and Preventing Trademark Counterfeiting: Legal and Technological Perspectives from India and the U.S.A.," *International Journal on Science and Technology* 16, no. 3 (2025): 7158, <https://doi.org/10.71097/IJSAT.v16.i3.7158>.

<sup>16</sup> Bhargavi M., "Changing Trends of Counterfeit and Piracy," *Supremo Amicus* 23 (2021), <https://supremoamicus.org/wp-content/uploads/2021/01/Bhargavi-M.pdf>.

<sup>17</sup> Dongwon Jo, "Copied, Used and Modified," *ROMChip* 5, no. 1 (2023), <https://romchip.org/index.php/romchip-journal/article/view/181>.

components with commercially available ones, such as transistor-transistor logic (TTL) ICs. Even when custom chips cannot be easily duplicated, copycat companies may modify ROMs to replicate game programs, enabling the main board to perform similar operations without the original IC. The resulting code is executed using additional standard ICs.

Thus, copying bootleg products can be understood as an informal standardization process involving readjusted parts, products, and manufacturing processes. This technical practice has implications for product creation and marketing. While the quality of craftsmanship is likely to lack precision, the practice may allow individuals to build functional machines using affordable and readily available components, such as standard ICs, for import and resale. Copycat companies can circumvent limited historical and technical resources by breaking the circuit board standards adopted by predecessor companies.

The next point to emphasize is the fundamental difference between counterfeit and bootleg products. Counterfeit goods are cheaply manufactured items and intended to closely resemble original products. However, they rarely carry the name of the actual license holder. These products are often released into foreign markets that cannot access legitimate products, although this is not always the case. Conversely, counterfeit VGA cards that are mere reproductions are typically produced on a much smaller scale, are not released at retail in any market, and are solely made to imitate the originals as closely as possible. A deliberate level of deception is involved from the beginning of the reproduction process, which is not the case with bootlegs. This distinction makes it increasingly difficult to distinguish between genuine and fake products. For example, the Nvidia Bios TechPowerUp VGA, which turned out to be counterfeit and had been installed on the ASUS GTS 450 (ENGTS450/DI/1GD5), failed to function. It could not be recognized as an Nvidia VGA and was only identified as a Microsoft Basic Display Adapter, rendering it unable to install any drivers.

**Figure 1:** Example of a Counterfeit VGA Card



Source: techpowerup.com

Meanwhile, bootleg goods are products inspired by the success of other items in a similar field but are packaged with different product design certificate and brand registrations. At first glance, they may not appear to violate brand protection and product design rights. Although the two VGA card brands may not infringe trademark or industrial design rights, they must be examined to determine whether the layout concept and/or integrated circuit violates IC rights. The core value of a VGA card lies not in its brand or external design but in its integrated circuit. Therefore, determining whether a bootleg product is infringing depends on identifying its integrated circuit as part of the protected IC layout. Integrated circuit layout design generally differs from industrial design, as its focus is not on external appearance but on the physical location of each element to ensure the success of the resulting electronic function.

Both counterfeit and bootleg IC products are imported from China to developing countries, including Indonesia, due to market demand. Millions of refurbished and fake bootleg IC chips are freely traded from Huaqiangbei in Shenzhen, China—Asia's largest electronics market.<sup>18</sup> China remains a highly influential country on high-tech development. However, Indonesians' need for advanced technology is not yet matched by their awareness of intellectual property rights and their purchasing power of original products. This issue affects many computer companies with branches in Indonesia, including domestic manufacturers. It is also possible for a product to resemble another without being a bootleg. One example is ARKTEK's GTX 1050 Ti. In 2019, Nvidia launched the GTX 1650 Super and GTX 1660 Super, and Arktek, an OEM company, subsequently produced the GTX 1050 Ti VGA. At first, this was assumed to be a bootleg VGA, commonly found in the market. However, upon checking, ARKTEK GTX 1050 Ti specifications listed on TechpowerUP, it was found to be a product with distinct core ideas, albeit inspired by Nvidia's designs.

Although creating a new layout design for an integrated circuit requires significant research investment, it is possible to replicate

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<sup>18</sup> Mokter Hossain, "The Shenzhen Ecosystem: What It Means for the Western World," *Technology in Society* 68 (2022): 101919, <https://doi.org/10.1016/j.techsoc.2022.101919>.

such designs at a much lower cost. Imitation can be achieved by capturing and copying each integrated circuit layer, then preparing a replica based on the resulting images. Bootlegging follows a similar process, using core components from the original product in a new circuit design and packaging them with a different external design to mislead consumers. This unauthorized engineering modification is often used for evaluation and educational purposes, but it becomes a violation when used for commercial purposes, especially in international trade, whether by exporters or importers.

In dealing with the issue of bootleg and counterfeit VGA products in Indonesia, legal protection must be strengthened. In addition, it is essential to identify the differences between original, bootleg, and counterfeit products. Counterfeit ICs can be identified by minor parallel scratches on the chip surface, inconsistencies in logo appearance, and irregularities in the surface of the pins. Advanced methods such as Terahertz time-domain spectroscopy (THz-TDS) can now identify fake IC products through the thickness of the surface.<sup>19</sup> Fake chips often have a different shine due to their origin from refurbished or idle products, and differences in batch numbers—even though batch tracking has improved—can also be revealing. If the brand embedded in the fake product matches the original, it is classified as a VGA counterfeit. If the embedded brand differs, it is classified as a VGA bootleg.

**TABLE 1:** Comparison of Bootleg and Counterfeit ICs

Bootleg IC	Counterfeit IC
Bootleg products are pirated or fake products made without an official process	Counterfeit products are pirated or fake products made without an official process
The method of hijacking the core technology in the core components of the original IC (in the form of VGA card) is considered the main idea of technological innovation in original products, by making modifications to aspects other than the core components	The method of hijacking the core technology in the core components of the original IC (in the form of VGA card) by complete plagiarized reproduction with reduced quality

<sup>19</sup> Chengjie Xi et al, "Enhancing counterfeit detection of integrated circuits through machine learning-assisted THz-TDS analysis", *Terahertz, RF, Millimeter, and Submillimeter-Wave Technology and Applications XVII*, SPIE, (2024), <https://doi.org/10.1117/12.3003766>.

Using a different brand on the IC (in the form of VGA card) product label, which may be registered	Using the same brand as the original pirated IC (in the form of VGA card)
Using a different packaging and casing design from the original IC product	Using the same product packaging and casing design as the original IC product
Using its own serial batch number, which differs from the original IC product	Using the same serial batch number as the original IC product, but upon closer inspection, differences can be found in the surface lines, serial codes, and mismatched QR codes (if any)
The bootleg IC brand does not have an integrated circuit certificate, even though it may have a brand certificate and an industrial design certificate	The IC product may mistakenly appear to have the same integrated circuit certificate as the original IC product brand, but it does not, because the IC certificate only applies to the original product. In fact, many original IC products do not yet have an integrated circuit certificate at the Directorate General of Intellectual Property in Indonesia because no application has been registered
Semiconductor components of lower quality	Semiconductor components of lower quality
No license agreement	No license agreement

Source: Authors, 2025 (edited)

## B. Legal Protection for Integrated Circuit Aspects of Bootleg and Counterfeit IC Products

The threat of remodified VGA cards has also occurred in the production of artificial intelligence-based technology. The Nvidia GeForce RTX4090, for example, has become the core VGA card for AI chips in China, whose sophisticated integrated circuit technology has been repeatedly modified by irresponsible manufacturers before being imported to developing countries such as Indonesia. Nvidia

GeForce RTX 4090, ASUS ROG STRIX, and Gigabyte Gaming OC VGA cards are dismantled and then modified into VGA card products with other brands and designs, resulting in bootleg products with blower models derived from the original variants. The original Nvidia GeForce RTX 4090 VGA card, stripped of its core integrated circuit technology—namely the AD102 component and GDDR6X memory—is sold under various other brand variants at very low prices, around fifty dollars, to AI development companies in China and then imported into other countries, including Indonesia. Meanwhile, the AD102 component and GDDR6X memory, which should be protected by integrated circuit rights in the Nvidia GeForce RTX 4090 VGA card, are modified and embedded into other VGA card products to become AI chips with different brands and product designs, thereby creating the next bootleg product. From a single Nvidia GeForce RTX 4090 VGA card, two types of bootleg products can be produced.

The Nvidia GeForce RTX 4090 VGA card variant is the most frequent target of unauthorized modification because its software ecosystem is already established and supported by TensorRT and TensorTT-LLM for Windows 11, which are highly compatible with AI applications, compared with ASUS ROG STRIX and Gigabyte Gaming OC. Modifications are also made to the VGA card slot design, and a unique reference PCB is produced so that a new slot is added, equipped with a dual-slot system cooler to optimize space on the AI-supporting servers.

The U.S. government officially banned the RTX 4090 in China in 2023 due to its high-performance and potentially risky computing capabilities. The ban aims not only to prevent long-term violations of integrated circuit rights as part of IPR, but also to curb opportunities for irresponsible technological appropriation by Chinese manufacturers—who have been accused of creating chip and semiconductor components without going through the research process, instead pirating VGA card technology from the U.S. and modifying it into counterfeit or bootleg products for exports to developing countries, including Indonesia. The policy of restricting international trade, implemented by the U.S. government through the Bureau of Industry and Security (BIS) under the Department of Commerce since 2022, includes a ban on the sale of high-end VGA cards to China and is expected to neutralize the situation.<sup>20</sup>

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<sup>20</sup> Paul Triolo, “The Evolution of China’s Semiconductor Industry under US Export Control,” *American Affairs*, 2024, <https://americanaffairsjournal.org/2024/11/the-evolution-of-chinas-semiconductor-industry-under-u-s-export-controls/>.

Integrated circuits (ICs), especially those embedded in VGA cards, are key technologies that underpin U.S. global dominance and are viewed as critical to slowing China's technological growth.

Export controls were designed by the U.S. government to limit sales of VGA and AI chips to China because of concerns over their dual-use purposes related to the country's military modernization while increasing its economic and technological competitiveness. The government retains veto power over transactions of IPR products in the technology sector classified as "restricted." Companies seeking to export such products must first obtain authorization from federal agencies.

Export restriction has been imposed on several VGA card types, including the AI A100, A100X, H100, A800, H800, L40, and L40S. The RTX 4090 remains the most popular and most restricted model. These measures are in line with the CHIP Act issued by the U.S. government to enhance the competitiveness of its semiconductor manufacturing and protect its integrated circuits. Unfortunately, prior to the embargo, Chinese companies developing AI technologies had imported large quantities of Nvidia VGA cards from the U.S., causing stock shortages and price fluctuations. Following the export embargo, the price of the RTX 4090 in China immediately surged to 15,000 yuan—approximately 32 million rupiah. As of the time of this research was conducted, the import of bootleg and counterfeit VGA card products into Indonesia continues, and efforts to normalize the situation remain unrealized. Measures to modify piracy into bootleg and counterfeit forms are still being carried out covertly. The continued interdependence of electronic component supplies between the U.S. and China further complicate this issue.<sup>21</sup> Ironically, much of the advanced technology produced by the U.S. relies on components manufactured exclusively in China.<sup>22</sup>

Over the past two decades of participation in the multilateral trading system, the Chinese government has issued various regulations restricting the export of pirated VGA products. However, the continued exports of bootleg and counterfeit VGA products from China to Indonesia contradicts China's own export control policies,

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<sup>21</sup> Jie Yang et al, "Unveiling the Link between Operational Interdependency and Supply Chain Performance," *Benchmarking: An International Journal* 31, no. 9 (2024): 3242–3256, <https://doi.org/10.1108/BIJ-10-2022-0634>.

<sup>22</sup> Yuxin Peng, "The Relationship between US-China Semiconductor Friction and US National Security: A Realism Perspective," *Obrana a strategie (Defence and Strategy)* 24, no. 1 (2024): 041–060, <https://doi.org/10.3849/1802-7199.24.2024.01.041-060>.

particularly the Export Control Law enacted by the Ministry of Commerce in 2017.<sup>23</sup> In response to U.S. restrictions, the Chinese government filed a lawsuit against the U.S. government at the World Trade Organization (WTO), alleging that the restrictions on semiconductor exports has unilaterally paralyzed China's semiconductor industry and accusing the U.S. of abusing export control measures.

As previously discussed, the U.S. directive ordering Nvidia and other VGA card manufacturers to halt RTX sales to China is a strategic step to block access to advanced technology originally developed in the U.S. These technologies have been considered potential threats to national security since 2008. Thus, the issue extends beyond trade losses and IPR violations due to piracy.

This matter implicates not only IPR enforcement but also the dynamics of international technology trade wars and national efforts to safeguard technological inventions. The U.S. government's concerns about the piracy and dismantling of original VGA cards—transforming them into bootleg and counterfeit products—are not limited to entertainment or cryptocurrency mining. These practices are suspected to support supercomputer technology, which has produced a new type of AI applications without expensive research costs, thereby further increasing competition in the global semiconductor industry.<sup>24</sup>

The U.S. government has imposed export restrictions on its core semiconductor components used in AI development on the pretext of violations of semiconductor component counterfeiting.<sup>25</sup> These concerns were proven in January 2025, when Nvidia and other VGA card manufacturers experienced a drastic decline in shares following the rise of DeepSeek—an original AI brand from China.<sup>26</sup> DeepSeek, positioned as a rival to ChatGPT, does not

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<sup>23</sup> Harry Zhang, "Export Control Risks in China: Why Preparation is Key to Compliance," *International Tax Review*, 2024, <https://www.internationaltaxreview.com/article/2cpwb6a131v71nemjtyps/sponsored/export-control-risks-in-china-why-preparation-is-key-to-compliance>.

<sup>24</sup> Chan-Yuan Wong et al, "Geopolitics and the Changing Landscape of Global Value Chains and Competition in the Global Semiconductor Industry: Rivalry and Catch-up in Chip Manufacturing in East Asia," *Technological Forecasting and Social Change* 209 (2024), <https://doi.org/10.1016/j.techfore.2024.123749>.

<sup>25</sup> Victor Habib Lantyer, "How U.S. Trade Sanctions Fueled Chinese Innovation in AI: The DeepSeek Case," preprint, SSRN, 2025, <https://doi.org/10.2139/ssrn.5112973>.

<sup>26</sup> Derek Saul, "Biggest Market Loss in History: Nvidia Stock Sheds Nearly \$600 Billion As DeepSeek Shakes AI Darling," *FORBES*, 2025,

require many premium chips or VGA cards from Nvidia and other major brands.

Indonesia, as an import destination and fellow member of WTO, has its own legal regulations regarding the protection of integrated circuit products (as part of the IPR) in compliance with the ratification of TRIPS, as reflected in the issuance of Law No. 32 of 2000. Therefore, it is necessary to further examine the implementation of law enforcement in Indonesia regarding the import of VGA card products from China in the form of bootlegs or counterfeits and the country's compliance with other ratified in international trade regulations .

Integrated circuit layout designs, which serve as blueprints for integrated circuits used in various information technology products—such as computers, mobile phones, and communications equipment—possess characteristics that are not easily accommodated within the existing legal framework of intellectual property rights. In Law No. 32 of 2000 on Layout Designs of Integrated Circuits (hereinafter referred to as the Layout Design of Integrated Circuits Law), the definition of integrated circuit layout is divided into two parts. Article 1, paragraph (1), defines an integrated circuit as a product in finished or semi-finished form that contains various components, at least one of which is an active component, wholly or partially interconnected and formed in an integrated manner in a semiconductor, intended to produce electronic functions. Meanwhile, Article 1, paragraph (2), defines layout design as the creation of a three-dimensional layout of various elements, at least one of which is an active element, and some or all of the interconnections in an integrated circuit. This three-dimensional layout is intended to facilitate the creation of an integrated circuit.

Legal protection for integrated circuit layout designs can only be granted to original products that, at the time of their creation, were not considered commonplace among designers. This originality provision is a further embodiment of the IPIC Treaty, which states:

"… it shall apply to layout design (topographies) that are original in the sense that they are the result of their creators own intellectual effort and are not commonplace among creators of layout design (topographies) and manufactures of integrated circuit at the time of their creation"

The protection period for original integrated circuits is ten years

from the first commercial use or from the date of application receipt. TRIPS mandate no less than ten years of protection, regardless of whether a country implements a registration system. Right holders have special rights to use, manufacture, sell, import, and/or distribute goods containing all or part of the circuit layout design.

Without permission from the rights holder, other parties are prohibited from carrying out all or part of these actions (Article 8, paragraph (2), Law No. 32 of 2000). Violations may be punished with a maximum imprisonment of seven years and a maximum fine of 300,000,000 rupiah (Article 42, Law No. 32 of 2000). This provision is in line with TRIPS, which identify the following as violations of integrated circuit layout design:

"...importing, selling or otherwise distributing for the commercial purpose layout design, an integrated circuit in which protected design is incorporated, or an article incorporating such an integrated circuit only in so far it continues to contain an unlawfully reproduced layout design".

However, action against such violations should be understood as a complaint offence (Article 42, paragraph 3, Law No. 32 of 2000). This means that the rights owner must first submit a report to the appropriate authorities, including the Directorate General of Intellectual Property, especially the Directorate of Patents, Integrated Circuit Layout Design, and Trade Secrets (Article 294, Regulation of the Minister of Law and Human Rights No. 1 of 2024 on the Organization and Work Procedures of the Ministry of Law).

Law Number 32 of 2000 aims to protect integrated circuits in the form of silicon chips, which are the primary driver of technological progress. Creative elements that can be protected by integrated circuit layout design include three-dimensional creations consisting of electronic elements that contain at least one active element. These may be products in finished or semi-finished form, and they must be capable of producing electronic function. Unfortunately, classifying layout design plagiarism as bootlegging is not as straightforward as identifying a pirated or counterfeit product. Bootlegs are in a legal gray zone, where the boundaries tend to favor those with prior legal protection.<sup>27</sup> Bootlegs create gray-market electronics in Indonesia. The first step in identifying infringement is to determine which of two or more similar products was first

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<sup>27</sup> Anika Stephan-Korus, "Bootlegging in a Technology-Driven Organization: Process, Challenges, and Opportunities", *Series on Technology Management*, oleh Peter Augsdorfer, World Scientific 39, (2022), [https://doi.org/10.1142/9781800612266\\_0004](https://doi.org/10.1142/9781800612266_0004).

registered with a Layout Design of Integrated Circuits certificate. This can be verified through the Directorate General of Information and Technology portal. This assessment is independent of whether the brand holds a trademark certificate, because in the context of bootleg infringement, the key issue is the integrated circuit, not the brand. Bootleg products are marketed under a completely different new trademark. The second step involves identifying the percentage of similarity and basic ideas between two or more products, including the quality of their electronic components. The third step is to verify whether a license agreement exists between the similar products. VGA bootlegs refer to products that imitate or manipulate the function of the original VGA connector without official licensing or permission. In the context of IC products, bootlegging refers to goods that are legally purchased and bear a registered brand from one country, but are then imported to another country and sold without the permission of the integrated circuit rights holder. This occurs because the integrated circuit components have been secretly pirated through unauthorized duplication.

Software and hardware licensing agreements are formed to facilitate transaction and outsourcing transparency while ensuring confidentiality between parties.<sup>28</sup> The license agreement may also include permission to develop the original product without reducing its original value, regardless of whether a third party is involved as the software developer. With a license agreement, the holder of layout design of integrated circuits rights has the authority to grant those rights to another party to carry out acts of making, using, selling, importing, exporting, and/or distributing goods that contain all or part of the design covered by the layout designs of integrated circuits. This includes use for research and educational purposes, provided it does not harm the reasonable interests of the rights holder. Any actions otherwise prohibited for parties other than the rights holder may be under a license agreement. The license agreement must be registered in the General Register of the Integrated Circuit Layout Designs at the Directorate General and is subject to official fees. License agreements that are not recorded in the General Register of Layout Designs and Integrated Circuits do not apply to third parties.

License agreements are prohibited from containing provisions that may have detrimental effects on the Indonesian economy or

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<sup>28</sup> Xiufeng Li et al, "Technology Licensing Contract Design Considering Royalty Transparency and Demand Information Asymmetry with Downstream Co-Opition," *Expert Systems with Applications* 238 (2024): 122183, <https://doi.org/10.1016/j.eswa.2023.122183>.

result in unfair business competition, as IP law and antitrust law share a common utilitarian genesis.<sup>29</sup> Provisions regarding license agreements are regulated by Presidential Regulation No. 36 of 2018 concerning the Recordation of Intellectual Property License Agreements. Even after recordation, a license agreement may still be amended.<sup>30</sup> As long as the changes only concern the names of the subjects and details of the licensed objects, a new application must be submitted to record the amended license agreement. If the changes are outside those details, notifications of changes, along with payment of the applicable fee, is sufficient. A registered license agreement may also be revoked before its expiration if there is an agreement between the licensor and the licensee, a court decision, or other reasons permitted by statutory regulations.

Counterfeit integrated circuits, or counterfeit chips, are non-genuine semiconductor components found in many electronic devices.<sup>31</sup> The circulation of these fake chips has become a large and profitable business that has increased significantly.<sup>32</sup> Copycat companies use counterfeit chips with fewer transistors than genuine ones, or entirely different configurations, to reduce production costs. Research costs are avoided because the original product is simply copied, eliminating the need for prolonged research and testing. This results in extremely low prices. While the difference is not immediately noticeable, they eventually affect device performance, stability, and compatibility, often leading to hardware failure. In contrast, hardware security is highly dependent on the safe circulation of original integrated circuits.

Once bootleggers establish themselves in a particular market, they build networks related to similar activities and expand their operations. As these networks expand, the electronics market becomes saturated with both bootleg and counterfeit goods, posing risks to consumer safety. Moreover, the availability of such products may result in litigation. One practical approach is to investigate markets with a high probability of containing counterfeit and bootleg

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<sup>29</sup> Jay Dratler and Stephen M. Mc John. *Licensing of Intellectual Property*. (Ohio: Law Journal Press, 2025).

<sup>30</sup> Article 18 on Presidential Regulation Number 36 of 2018 concerning the Recordation of Intellectual Property License Agreements.

<sup>31</sup> Maryam Saadat Safa et al, "Counterfeit Chip Detection using Scattering Parameter Analysis," *2023 26th International Symposium on Design and Diagnostics of Electronic Circuits and Systems (DDECS)*, IEEE, (2023):99–104, <https://doi.org/10.1109/DDECS57882.2023.10139623>.

<sup>32</sup> Adam Hook, "New Solutions To Combat Counterfeits," *2024 Pan Pacific Strategic Electronics Symposium (Pan Pacific)*, IEEE, (2024):1–19, <https://doi.org/10.23919/PanPacific60013.2024.10436515>.

goods. The conflict of interests of domestic and foreign rights holder may be closely aligned, but effective countermeasures have yet to be identified.

The problem in the investigation process lies in the verification of bootleg products, which is more complex than proving counterfeit products. counterfeit goods are easier to identify, as sellers are increasingly open about selling fake products on online marketplaces. Companies holding IPR certificates for original integrated circuit products may attempt to encrypt their intellectual property in IC hardware and software to prevent counterfeit ICs from circulating and protect their business.<sup>33</sup> However, detection methods, such as electronic testing and bundling checks, must still need to be performed individually. Unfortunately, IC protection as an intellectual property right does not automatically apply across countries, unlike information and electronic transactions (ITE).

Integrated circuit protection is regulated globally by several agreements, including the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), a multilateral agreement adopted under the World Trade Organization (WTO), which requires members to provide adequate protection for intellectual property rights, including integrated circuit layout design. In addition, there are anti-piracy agreements at the bilateral and multilateral levels that include provisions for integrated circuit protection.

Indonesia's active participation in ratifying TRIPS includes Law No. 32 of 2000. However, regulations related to anti-piracy through international agreements with global effects, such as the Anti-Counterfeiting Trade Agreement (ACTA), have not been implemented by Indonesia. Even though Indonesia has formed an Anti-Piracy Task Force, it has not signed or ratified the ACTA agreement, which means the provisions regarding the enforcement of intellectual property rights against counterfeiting do not legally bind it. ACTA is an agreement that aims to establish international standards for enforcing intellectual property rights. It was negotiated between 2007 and 2010 and signed in Tokyo in October 2011 by the U.S., European Union, Canada, Australia, New Zealand, Mexico, Singapore, Morocco, Japan, and South Korea.<sup>34</sup>

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<sup>33</sup> Ashraful Tauhid et al, "A Survey on Security Analysis of Machine Learning-Oriented Hardware and Software Intellectual Property," *High-Confidence Computing* 3, no. 2 (2023): 100114, <https://doi.org/10.1016/j.hcc.2023.100114>.

<sup>34</sup> Jojuan F. Gross, "Baby, Bye, Bye, Bye: How the United States, Italy, & France Use Trademark Anti-Counterfeiting Mechanisms to Combat the Proliferation of Fake Goods in China," *Texas A&M Journal of Property Law* 7, no. 4 (2021):

ACTA seeks to create an international legal framework for countries that join voluntarily. It covers counterfeit goods, generic drugs, and copyright infringement on the internet. ACTA already protects rights holders from piracy, including counterfeiting, although it does not define bootleg specifically and cannot be interpreted as addressing trademark counterfeiting. Article 11.74 (1) provides that each party shall establish criminal procedures and penalties in cases of wilful copyright or related rights piracy and trademark counterfeiting on a commercial scale. Article 11.74 (2) concerns the wilful importation of pirated copyright goods and counterfeit trademark goods.

ACTA aims to combat piracy of intellectual property rights products by improving practical international trade cooperation.<sup>35</sup> Its significance lies in its potential impact on multilateral and bilateral trade negotiations as forum for regulatory reform in the IPR field in line with IPR governance—not merely contextual.<sup>36</sup> The Indonesian government's failure to sign the ACTA agreement shows its unpreparedness to combat piracy, despite being a WTO member. This is because the agreement requires transparency in its clauses to respect a country's IPR assets. Internationally, transparency is essential for state-to-state relations, as it allows states to monitor the implementation of treaty obligations and ongoing compliance.

On the other hand, the Indonesian government has demonstrated readiness to engage in free trade by signing and ratifying the ASEAN-China Free Trade Area (ACFTA). This agreement, formed among ASEAN member countries and China, aims to eliminate or reduce trade barriers in both tariffs and non-tariff aspects, while increasing access to service markets, investment regulations and provisions, as well as economic cooperation. It was signed on November 12, 2017, and implemented on August 1, 2019, through the Upgrading Protocol ACFTA.<sup>37</sup> While ACFTA facilitates import and export activities between Indonesia and China, it enables the entry of counterfeit products and bootleg VGA cards. One clause

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539–566, <https://doi.org/10.37419/JPL.V7.I4.1>.

<sup>35</sup> Michael Blakeney, *Covert International Intellectual Property Legislation: The Ignoble Origins of the Anti-Counterfeiting Trade Agreement (ACTA)*, Michigan State University College of Law, (2013), <https://doi.org/10.17613/QPJE-F693>.

<sup>36</sup> Meredith Kolsky Lewis, "Plurilateralism and Free Trade Agreements," *The Journal of World Investment & Trade* 26, no. 1–2 (2025): 82–115, <https://doi.org/10.1163/22119000-12340353>.

<sup>37</sup> Dyah Titis Kusuma Wardani et al, "The impact of gross domestic product, exchange rates and ACFTA implementation on Indonesia's trade intensity index," *Jurnal Ekonomi & Studi Pembangunan* 25, no. 1 (2024): 62–77, <https://doi.org/10.18196/jesp.v25i1.22191>.

allows the shipment of goods between member countries, both from China to Indonesia and vice versa, without processing and entitled to tariff concessions. These provisions apply only to registered categories. The entry of conductor-category goods that have not been registered with the Ministry of Trade of the Republic of Indonesia constitute illegal importation. This reveals an imbalance that is detrimental to Indonesia.

Each WTO member country that has ratified TRIPS is expected to have laws governing integrated circuit layout design, thereby providing protection for such designs within its territory, though mechanisms vary. In countries requiring registration, such as Indonesia, an application must be submitted before protection is granted. In other countries, such as the U.S., protection is granted as long as it can be proven that the first commercial exploitation occurred anywhere in the world.

Efforts to protect integrated circuits in Indonesia are further complicated by the absence of priority rights in Law No. 32 Year 2000, both in its text and administrative practice. Integrated circuit protection does not automatically apply across borders. To be recognized and protected in other countries, the rights owner must usually register the layout design in accordance with the legal policies and procedures applicable in each country.<sup>38</sup> As a result, the Indonesian government cannot guarantee legal enforcement against bootlegs and counterfeit products originating from foreign companies that have not registered an IC certificate with the Directorate General of Intellectual Property. Therefore, well-known technology companies that establish branches and target the Indonesian market typically register IC certificates through a priority application mechanism. Unfortunately, the IC Law does not yet provide for registration mechanism facilities through priority rights. Applications for IC registration by foreign parties still follow the general mechanism. Applicants residing outside the territory of the Republic of Indonesia must apply by proxy and declare their legal domicile within Indonesia.

The weakness of Law No. 32 of 2000 lies in the absence of clear provisions on priority rights. This differs from the provisions of Law No. 65 of 2024 concerning Patents and Law No. 31 of 2000 concerning Industrial Designs. In other countries that have implemented priority rights, such as the U.S., integrated circuits can

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<sup>38</sup> Ivan Nachev et al, "Intellectual Property and Security in the Integrated Circuits Industry," *Strategies for Policy in Science and Education-Strategii na Obrazovatel'nata i Nauchnata Politika* 32 (2024): 71–86, <https://doi.org/10.53656/str2024-1s-5-int>.

be registered without undergoing a substantive examination stage, allowing the application of priority rights to proceed equally. In contrast, Indonesia requires registration applications to be filed within two years, and protection begins from the date of first commercial exploitation. This is because the originality aspect in Law No. 32 of 2000 is not only administrative but also includes the substance of the design. However, it is often overlooked and typically only arises during disputes.

Priority rights refer to the rights granted to applicants to submit applications with the date of receipt in the country of origin being considered the same as the date of receipt in the country of destination.<sup>39</sup> These rights apply if both countries are members of the Paris Convention for Protection of Industrial Property or the Agreement Establishing the World Trade Organization. Priority rights provide several benefits, including allowing IPR owners to obtain protection in other WTO member countries that have ratified TRIPS, even if they register their rights later through the priority rights mechanism. Through priority registration, they can exercise their IC rights and prohibit others from making, using, selling, importing, exporting, and/or distributing goods containing all or part of IC rights with a protection period of ten years starting from the date of receipt or the date the layout design was first exploited commercially. Under priority rights, the registrant is not required to prove novelty, as the disclosure made in the country of origin is also valid for registration in other WTO member countries (Article 4 H of the Paris Convention).

Intellectual property rights play a significant role in enhancing market competitiveness and strengthening protection. They serve as a preventive measure to anticipate unhealthy business competition and minimize counterfeit products circulating in the market.<sup>40</sup> If an IC work has been registered with a Layout Design of Integrated Circuits certificate, the Indonesian government is obligated to guarantee legal protection for the foreign company's IC products against illegal imports of bootleg and counterfeit products.

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<sup>39</sup> Lisa Jorgenson, Carsten Fink, "WIPO's Contributions to International Cooperation on Intellectual Property," *Journal of International Economic Law* 26, no. 1 (2023): 30–34, <https://doi.org/10.1093/jiel/jgac049>.

<sup>40</sup> Triyono Adi Saputro et al, "Enhancing domestic product competitiveness through electronic intellectual property in Indonesia: a comparison to China, Malaysia, and Thailand," *Wacana Hukum* 29, no. 2 (2023): 112-129, <https://doi.org/10.33061/wh.v29i2.9577>.

## Conclusion

Counterfeit VGA products from abroad are imported into Indonesia due to the public's limited legal awareness of IPR protection and weak government enforcement against counterfeit and bootleg technology products, especially VGA cards. This issue is also linked to national security and the global technology trade war, which affects Indonesia as an importing country from both China and the U.S. Counterfeit products copy the original integrated circuits and branding, while bootlegs imitate the outline and basic idea of the original product without copying the brand. Both are fake products that violate Law No. 32 of 2000 on Layout Design of Integrated Circuits (especially Article 8 and 42), which aligns with TRIPS and the IPIC 1989 (Washington Treaty). However, several steps can be taken to identify bootlegs and counterfeit VGA card to avoid confusion with original products. These include verifying the availability of an IC certificate, assessing the percentage of similarity, analyzing the main idea of technology invention, evaluating the quality of electronic components and quality control, and confirming the presence of a license agreement.

Integrated circuit protection does not automatically apply across borders. Therefore, for a company to have its IC rights recognized and protected in another country, it must manually register its layout design first, especially since Indonesia has not yet implemented priority rights. Accordingly, the Indonesian government should revise Law No. 32 of 2000 to include provisions for registration facilities through priority rights. Government efforts to enforce the law regarding violations of counterfeit and bootleg VGA products must also be accompanied by the commitment to participate in the Anti-Counterfeiting Trade Agreement, ensuring alignment with the role of the Anti-Piracy Task Force in Indonesia.

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