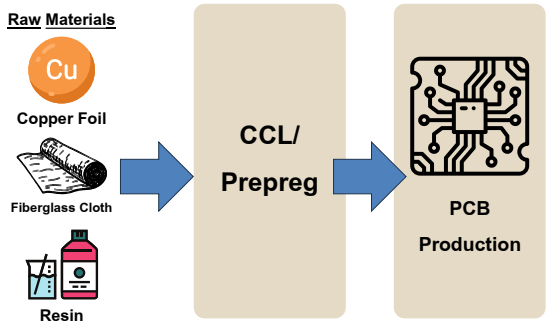
Industry Overview

- **Copper Clad Laminate (CCL) is a fundamental material used in the production of printed circuit boards (PCBs). It consists of a core made from fiberglass reinforced with resin, which serves as an electrical insulator, and is laminated with thin layers of copper on one or both sides.** This structure allows the laminate to undergo subsequent processes—such as imaging, copper etching, and plating—to form the electrical circuit patterns as designed. CCL functions both as a mechanical substrate and as a conductor at specific circuit points. Its stable electrical properties and high thermal resistance make it suitable for a wide range of electronic applications, including smartphones, computers, electric vehicles (EVs), 5G communication devices, and industrial automation systems. As an upstream material, CCL plays a critical role in supporting the advancement of next-generation electronic technologies.
- **Prepreg refers to fiberglass fabric that has been impregnated with resin in a partially cured state, known as the B-stage.** In this form, the resin is not fully hardened, allowing the material to soften and bond with other layers under heat and pressure during lamination. Prepreg serves dual roles as both an adhesive layer and an electrical insulator (dielectric layer) between copper foils and the core material in the fabrication of multilayer printed circuit boards (PCBs). Its structural and electrical characteristics—such as dielectric constant, thickness uniformity, thermal resistance, and signal loss performance—are crucial in determining the overall reliability and performance of the final circuit board. High-performance prepregs are engineered to support demanding applications in high-speed electronics, including AI servers, 5G communication devices, and electric vehicles (EVs). As a key engineered material, prepreg plays an essential role in modern PCB manufacturing, especially in an era where thinner, lighter, more complex, and highly stable electronic circuits are required.
- **The supply chain of the CCL/Prepreg industry can be divided into three main segments: 1) Upstream raw material suppliers, who provide the key inputs such as copper foil, fiberglass fabric, and resin.** These materials must meet stringent performance requirements—including high purity, uniform thickness, precise dielectric constants, and low signal loss characteristics. Due to their technical complexity, high-quality raw materials are primarily sourced from leading countries such as Japan, China, and Taiwan. As a result, countries without a domestic upstream base often face risks associated with volatile input costs and geopolitical uncertainties **2) Midstream manufacturers of CCL and Prepreg, who process the raw materials through resin impregnation, copper lamination, and hot pressing to produce copper clad laminates** with specific mechanical and electrical properties. Most CCL producers also manufacture prepreg in parallel within the same production lines, as both products share common base materials and similar processing technologies. This integrated production model enables economies of scope, improves quality control, and enhances flexibility in meeting customer specifications. Leading global players such as Kingboard Holdings, Shengyi Technology, Elite Material Co. (EMC), and Nan Ya Plastics operate full-scale production lines for both CCL and Prepreg. **3) Downstream users, mainly PCB fabricators,** who use CCL and prepreg to manufacture printed circuit boards by patterning, etching, and layering to meet

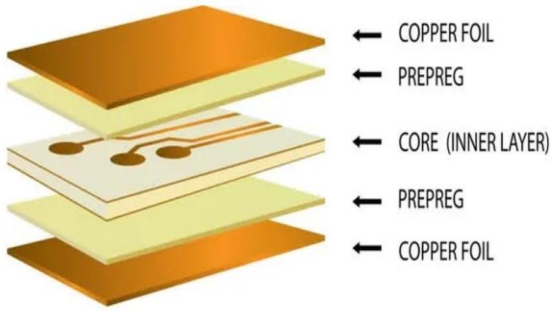
the design specifications of end-use applications. These PCBs are then supplied to a wide range of industries—including smartphones, computers, 5G devices, electric vehicles (EVs), and industrial electronics—underscoring the strategic role of CCL and prepreg in the electronics value chain.

Figure 1 Value Chain of the CCL/Prepreg Industry



Source: Compiled by LH Bank Business Research

Figure 2 Structure of Multi-Layer CCL

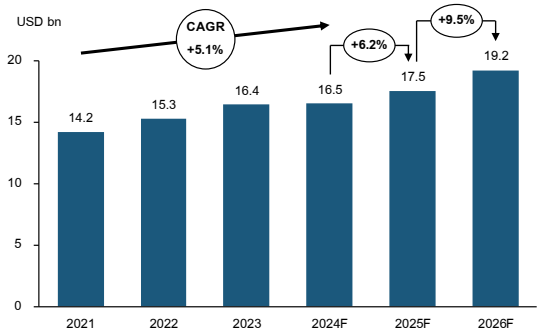


Source: Compiled by LH Bank Business Research

- **From 2021 to 2024, the global market value of Copper Clad Laminate (CCL) expanded steadily, in line with the overall growth of the electronics industry. The market is estimated to reach USD 16.5 billion in 2024 and is projected to grow to USD 19.2 billion by 2026,** representing a compound annual growth rate (CAGR) of approximately 6.2% during 2023–2026. This growth is driven by rapid advancements in 5G, Edge AI, Internet of Things (IoT) devices, and electric vehicles (EVs)—all of which require high-density interconnect (HDI) and substrate-like PCBs (SLP). These applications have significantly increased the demand for high-performance CCL grades, including high-frequency, low-loss, halogen-free, and ultra-thin copper foil laminates. In particular, strong demand has emerged in segments such as AI servers, radar-based advanced driver assistance systems (ADAS), and high-frequency modules in EVs, all of which require materials with precise dielectric constants and low dissipation factors to ensure optimal electrical performance.
- **In terms of market structure, the global Copper Clad Laminate (CCL) industry is considered semi-consolidated, with leading manufacturers concentrated primarily in the Asia-Pacific region. These dominant players possess vertically integrated capabilities across the entire supply chain—from upstream materials such as copper foil, fiberglass, and resin, to high-performance laminate production lines.** The top five players—Kingboard Holdings (Hong Kong), Shengyi Technology (China), Nan Ya Plastics and ITEQ Corporation (Taiwan), and Doosan Corporation (South Korea)—collectively account for over 60% of global market revenue. Over the past 2–3 years, these companies have expanded their production capacity in ASEAN countries, particularly Vietnam and Thailand, in response to rising labor costs in their home countries and to mitigate regulatory pressures from environmental standards and U.S. import tariffs.

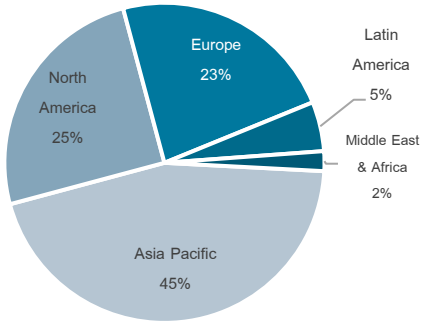
- **From a regional market perspective, the Asia-Pacific region continues to hold the largest share of the global CCL market, accounting for approximately 45%, followed by North America (25%) and Europe (23%). China remains the world's largest producer and consumer of CCL, representing more than 30% of global consumption.** Meanwhile, Taiwan and South Korea specialize in the production of high-grade materials used in high-speed servers and smart automotive modules. A noteworthy trend is the growing role of ASEAN countries—such as Thailand, Vietnam, and Malaysia—in the global supply chain. These countries are increasingly positioned as key manufacturing hubs for PCBs and final assembly of communication equipment and electric vehicles (EVs). As a result, demand for CCL and Prepreg in the region is expected to grow steadily over the medium to long term, supported by the expansion of electronics and automotive manufacturing in Southeast Asia.

รูปที่ 3 Global Market Value of CCL



Source: Compiled by LH Bank Business Research

รูปที่ 4 CCL Market Share by Region, 2023



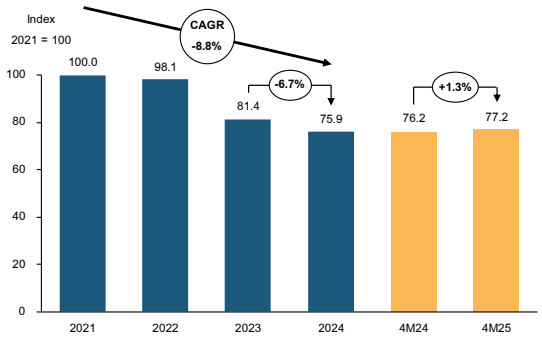
Source: Compiled by LH Bank Business Research

- **In Thailand, the number of companies operating in the Copper Clad Laminate (CCL) industry remains limited. The most prominent player is Thai Laminate Manufacturing Co., Ltd. (TLM), a subsidiary of KCE Electronics Plc., one of the largest PCB manufacturers in Thailand and Asia.** KCE's investment in domestic CCL production through TLM represents a form of vertical integration, aimed at cost control, ensuring consistent material quality, and reducing reliance on imported CCL from overseas suppliers. However, the overall structure of **Thailand's CCL industry still faces significant limitations, particularly in terms of production technology and access to upstream raw materials, which are almost entirely imported.** Furthermore, the domestic market size remains relatively small, as most PCB manufacturers in Thailand operate under an OEM model. This means they are required to source CCL based on client-specified suppliers, limiting the growth potential and scalability of local CCL producers.
- However, during 2023–2024, there has been a clearer trend of production base relocation by leading PCB manufacturers—particularly from Taiwan to Thailand. This is reflected in investment promotion applications submitted to the Board of Investment (BOI) by major Taiwanese firms such as ITEQ Corporation, Taiwan Union Technology Corporation (TUC), and Gold Circuit Electronics, with a combined project value exceeding THB 30 billion. **This momentum presents a significant opportunity for Thailand to develop its upstream PCB industry—particularly in the production of CCL and Prepreg—to support the expansion of downstream manufacturing.** Such development would reduce reliance on imported raw materials,

strengthen the resilience of the supply chain, and enhance the global competitiveness of Thailand's electronics manufacturing sector.

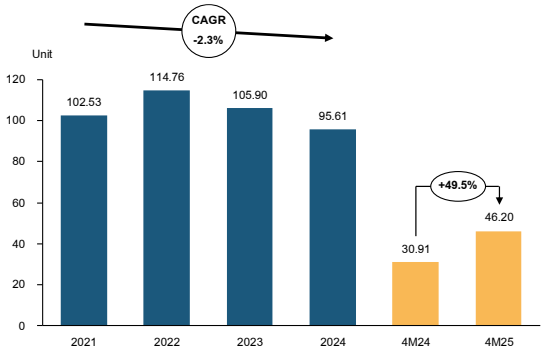
- **During the first four months of 2025, domestic demand for Copper Clad Laminate (CCL) showed a clear sign of recovery, as reflected by a 1.3%YoY increase in the Manufacturing Production Index (MPI) for the PCB sector.** This rebound marks the end of a prolonged downturn observed during 2021–2024, which was largely driven by the post-COVID correction in electronics demand, global inventory adjustments, and geopolitical disruptions affecting the semiconductor supply chain. In early 2025, however, Thailand's electronics component market began to show robust signs of recovery. **Domestic PCB sales volume surged by 49.5%YoY, while export value increased by 14.3%YoY,** primarily driven by a resurgence in orders for advanced technologies such as AI servers, 5G devices, and electric vehicles (EVs). In addition, a temporary frontloading effect was observed, as manufacturers with U.S.-based clients accelerated shipments to mitigate the potential risk of reciprocal tariffs under the trade policies of President Trump, anticipated to take effect in the second half of 2025. This recovery in PCB production has significantly bolstered local demand for CCL as a critical upstream input.

Figure 5 Manufacturing Production Index (MPI) of PCB



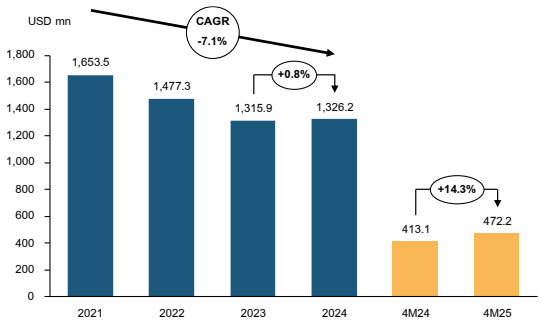
Source: Analysis by LH Bank Business Research based on data from the Office of Industrial Economics

Figure 6 Domestic Sales Volume of PCBs



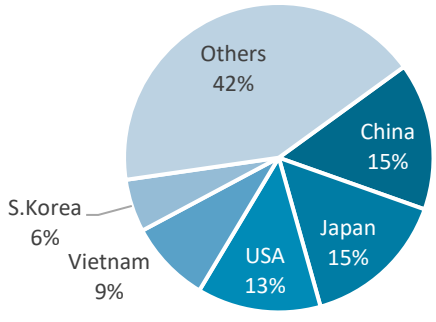
Source: Analysis by LH Bank Business Research based on data from the Office of Industrial Economics

Figure 7 Export Value of Thailand's PCBs



Source: Analysis by LH Bank Business Research based on data from the Ministry of Commerce

Figure 8 Thailand's Major Export Markets for PCBs, 2024



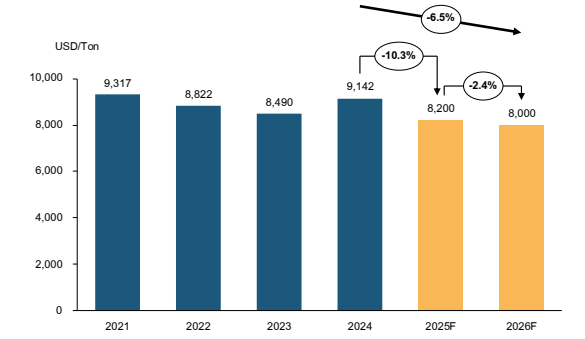
Source: Analysis by LH Bank Business Research based on data from the Ministry of Commerce

Industry Outlook

- **Thailand's Copper Clad Laminate (CCL) and Prepreg industry is expected to grow steadily during 2025–2026, supported by the recovery of the global electronics cycle, particularly in high-end applications** such as electric vehicles (EVs), AI servers, and 5G communication devices. These applications demand high-density interconnect (HDI) and multilayer PCBs that require base materials with superior dielectric performance, thermal reliability, and low signal loss. As a result, global demand for premium-grade CCL and Prepreg materials has accelerated, especially in industries requiring high-precision circuit performance and resilience to electrical and thermal stress. According to **Prismark Partners LLC, a global market intelligence firm specializing in the electronics industry, the global PCB market is projected to grow at an average annual rate of 5–6% over the 2024–2026 period. This expansion will inevitably drive increased demand for CCL and Prepreg materials,** particularly in Southeast Asia, which is emerging as a key downstream manufacturing base, notably in Vietnam and Malaysia. For Thailand, this presents an opportunity to position itself within the global supply chain—provided the country can attract upstream investments and develop a robust local supplier base. In this context, **the investment plans of Taiwanese firms such as ITEQ Corporation and Taiwan Union Technology Corporation (TUC), both of which have applied for investment promotion from Thailand's Board of Investment (BOI) totaling over THB 30 billion, are particularly promising.** These investments are focused on the production of CCL and Prepreg for HDI boards and are set to be located in the Eastern Economic Corridor (EEC), a zone already equipped with strong infrastructure and electronics industrial clusters. If Thailand can accelerate talent development and foster stronger linkages between upstream material suppliers and domestic PCB manufacturers, it will be well-positioned to overcome current structural constraints and develop a resilient upstream ecosystem for the electronics industry in the years ahead.
- On the cost side, the anticipated decline in key raw material prices—particularly copper and crude oil—will help ease cost pressures for Thai manufacturers, who still rely heavily on imported inputs. According to projections from **the World Bank, copper prices are expected to decline by an average of 6.5% per year, while crude oil prices may drop by approximately 13.8% annually during 2024–2026.** These trends are driven by a temporary slowdown in global demand, coupled with increased production capacity from major oil producers. Such developments are favorable for reducing the cost structure of industries with high raw material intensity, such as copper foil and resin-based inputs derived from petrochemical feedstocks. When combined with the gradual recovery in downstream demand, this will support the rebound in gross profit margins in the short to medium term—particularly for manufacturers that actively manage procurement through long-term purchasing agreements or forward contracts.
- However, Thailand's CCL/Prepreg industry remains in its infancy, having only recently begun attracting foreign investment over the past 1–2 years. As such, it still lacks several critical components necessary for sustainable development. One of the most significant limitations lies in **the shortage of specialized human resources—particularly in roles such as laminate process engineers, polymer chemists, and resin formulation developers—which are still in limited supply domestically.** This shortage compels local manufacturers to rely heavily on foreign technical experts during the initial phase of development. Simultaneously, **Thailand does not yet possess an upstream industrial base for key raw materials, including fiberglass cloth, copper foil, and specialty resins such as BT (Bismaleimide-Triazine), PPE**

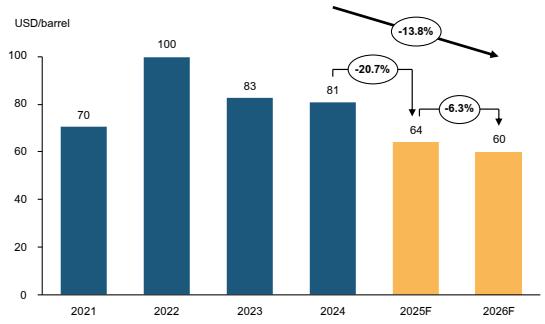
(Polyphenylene Ether), and LCP (Liquid Crystal Polymer). This dependency on imports exposes manufacturers to elevated production costs from logistics and global price volatility, while also increasing supply chain fragility due to external risks. These include trade protection measures and geopolitical tensions. In particular, the implementation of reciprocal tariffs by the United States—especially targeting imports linked to China or Taiwan—could significantly disrupt order continuity and affect supply chain linkages in which Thailand plays a role.

รูปที่ 9 Global Copper Price Forecast



Source: World Bank (as of April 2025)

รูปที่ 10 Global Crude Oil Price Forecast (Brent)



Source: World Bank (as of April 2025)

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