

Taiwan Glass Group

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Importance of Glass Fiber in the Critical Taiwan and Global Semiconductor Industry

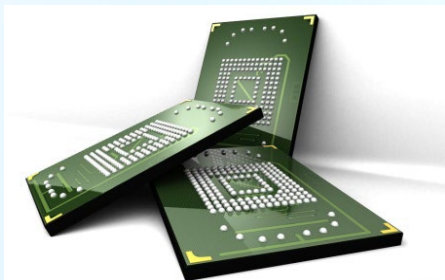
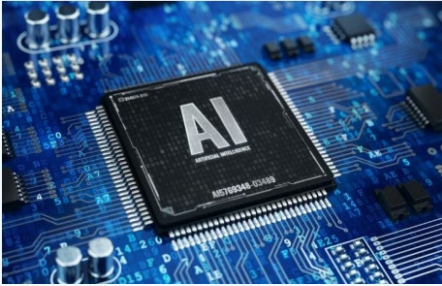
Market:

- PCB & Substrate
- Copper Clad Laminate
- Glass Fabric

Technical Trends in Glass Fabric:

- Dielectric Constant D_k
- Dielectric Loss D_f
- Coefficient of Thermal Expansion CTE

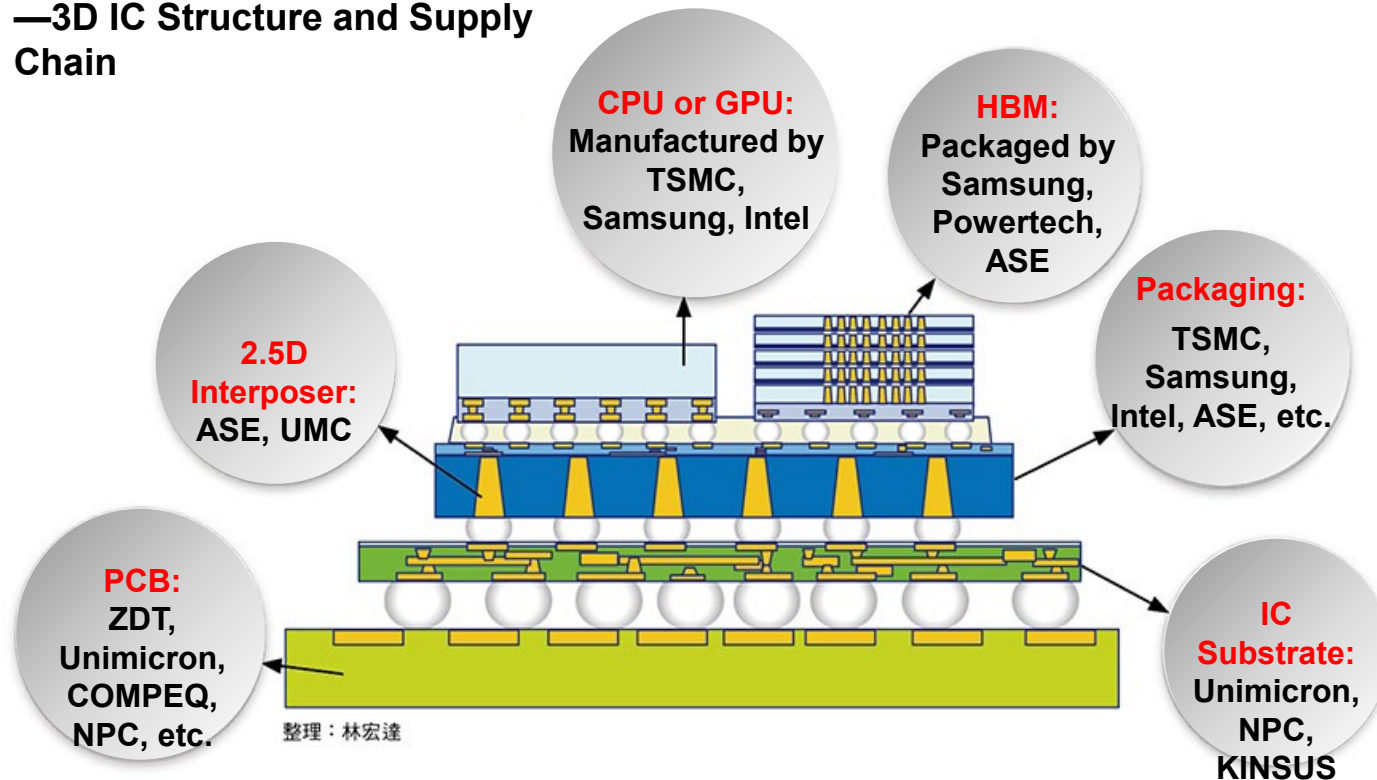
PCB applications



IC Structure Diagram

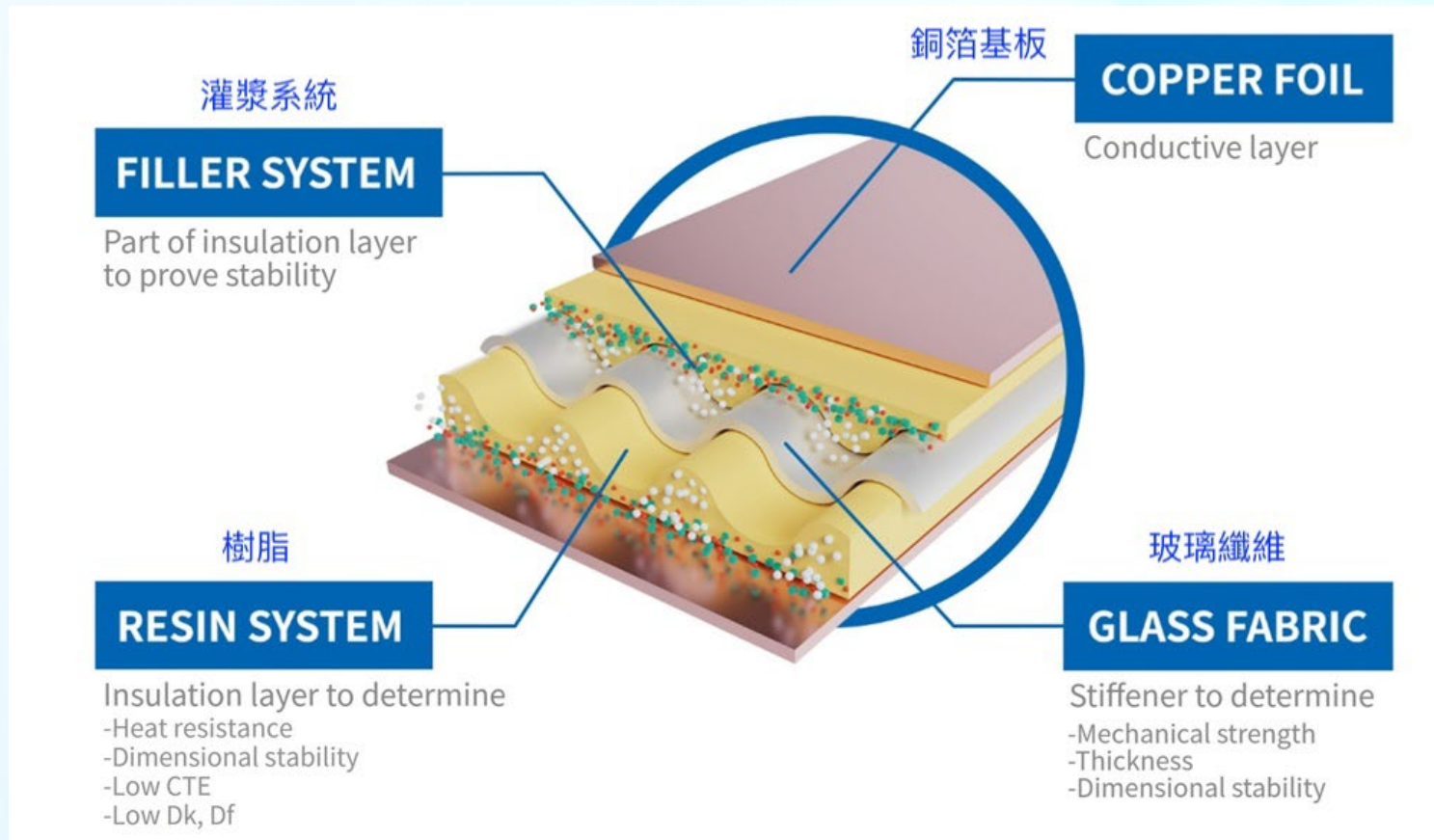
How is a single 3D IC packaged?

—3D IC Structure and Supply Chain



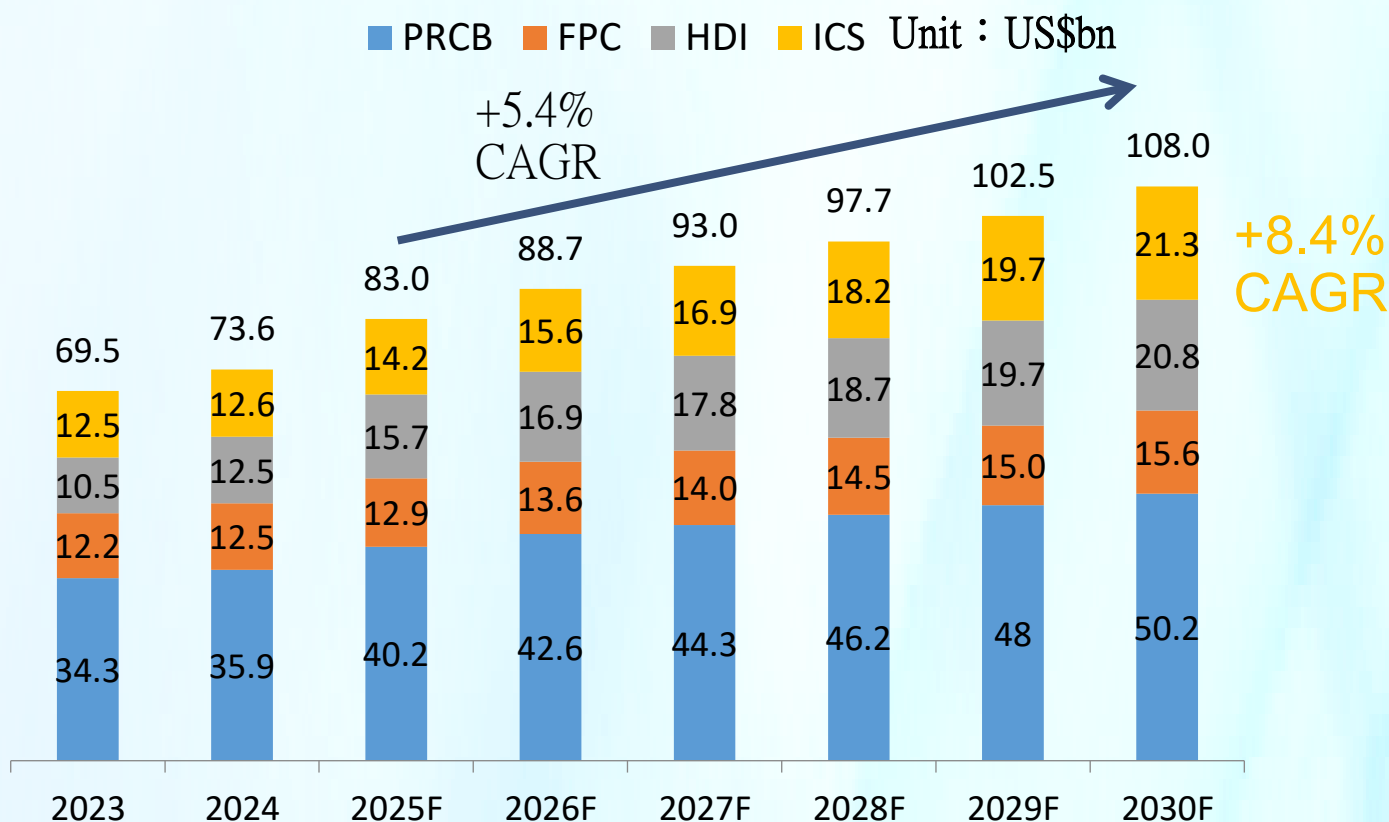
來源：財訊 623 期

CCL Structure Diagram



(Source : Doosan)

Global PCB Market Forecast

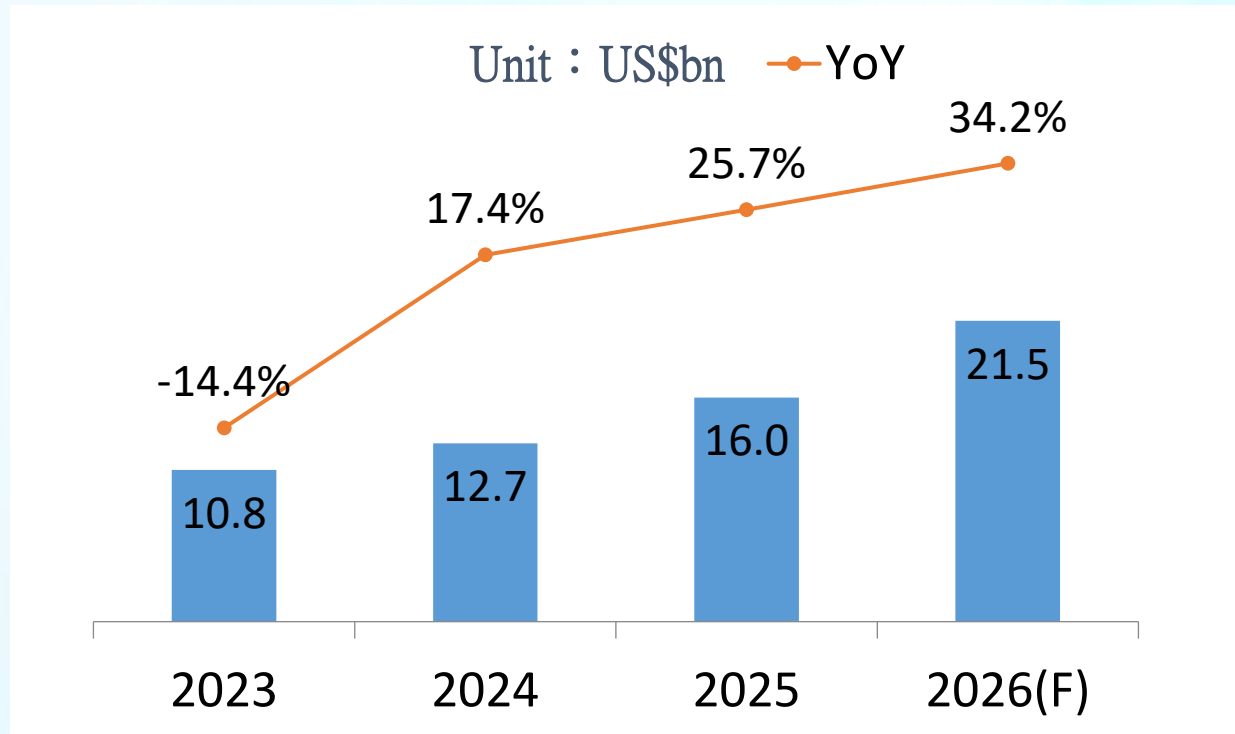


(Source : Prismark、臻鼎)

The growth of the global PCB market is primarily driven by demand from applications such as artificial intelligence (AI) servers, high-performance computing (HPC), electric vehicles (EVs), and advanced communication equipment.

Major PCB product categories include rigid PCBs (RPCB), IC substrates (ICS), flexible PCBs (FPC), and high-density interconnect (HDI) boards.

Global CCL Market Trends



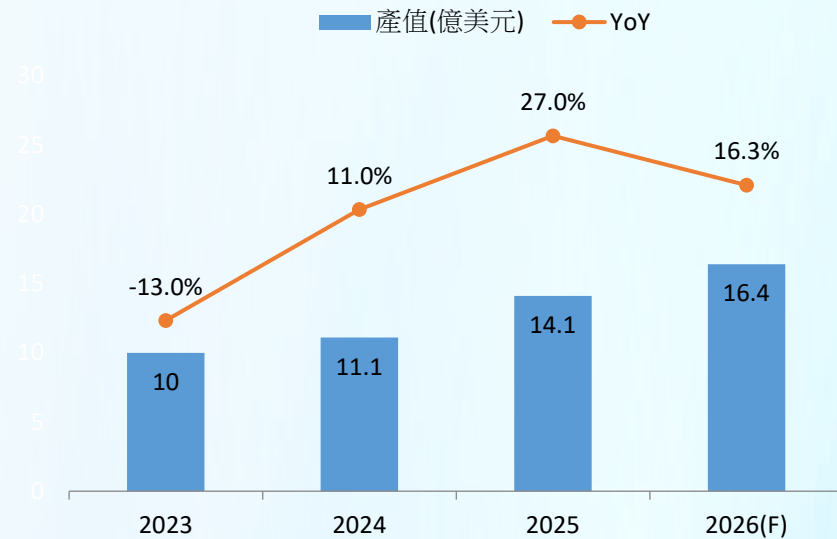
(Source : TPCA季刊)

With the rapid growth of AI servers and high-performance computing (HPC), two major impacts on the CCL market have emerged:

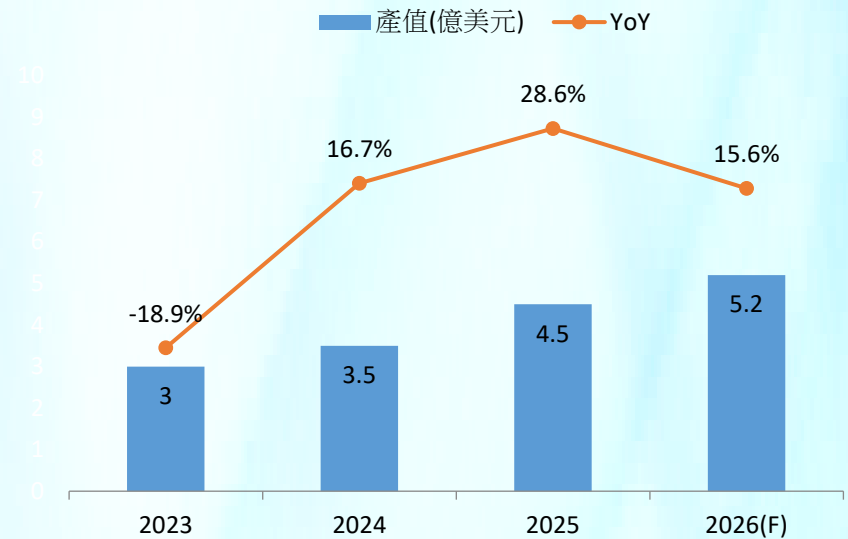
1. AI servers—such as motherboards, backplanes, and switch boards—generally adopt high-layer-count designs (often exceeding 40 layers), significantly increasing the consumption of CCL per system.
2. Furthermore, as servers evolve toward higher-speed transmission and demand for high-speed signal integrity in AI servers and networking equipment continues to increase, CCL materials are steadily advancing toward low-loss performance. This trend is driving the transition to higher-grade materials (e.g., M9 and above)

Global CCL (IC Substrate) Market Trends

BT substrate



ABF substrate



(Source : TPCA季刊)

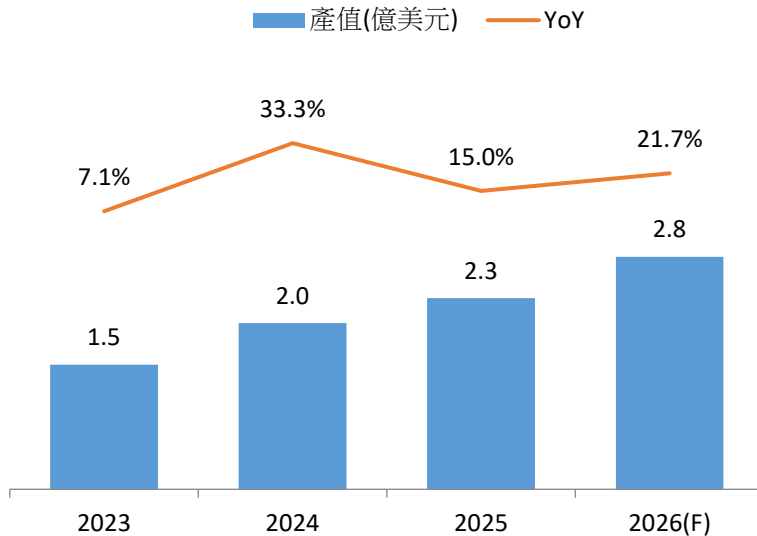
Global IC substrates are mainly categorized into two types: BT substrates and ABF substrates.

ABF (Ajinomoto Build-up Film) substrates are primarily used in high-end computing applications (such as AI, HPC, GPC, and CPU), offering high wiring density and high I/O capability.

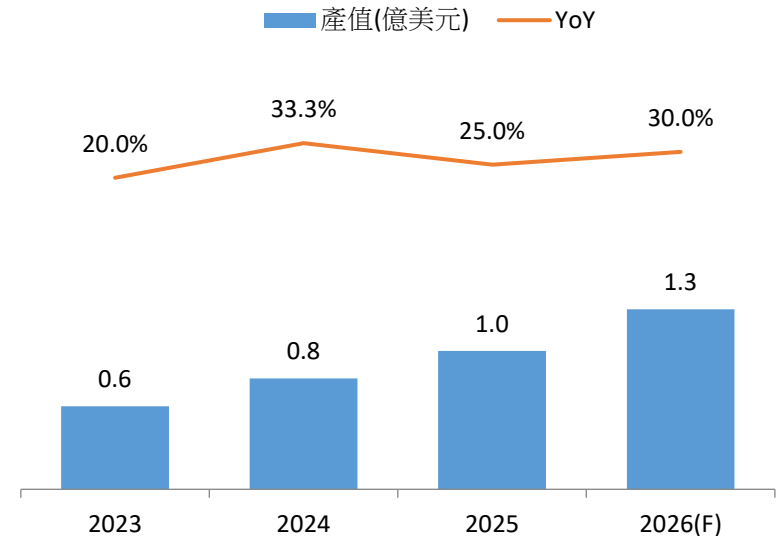
BT (Bismaleimide Triazine) substrates are mainly applied in consumer electronics, communication chips, and memory modules, representing a mature and cost-driven market.

Global Glass Fiber Fabric Market Trends

Low Dk



Low CTE



(Source : TPCA季刊)

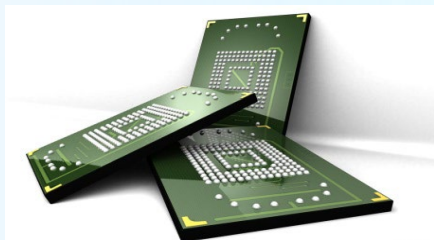
Currently, high-performance glass fabrics can be classified into two main categories:

1. Low-Dk glass fabrics, which are used in high-frequency and high-speed CCL to reduce signal transmission loss at high frequencies.
2. Low-CTE glass fabrics, which are used in IC substrates to lower the coefficient of thermal expansion (CTE), thereby enhancing dimensional stability and reliability of package structures.

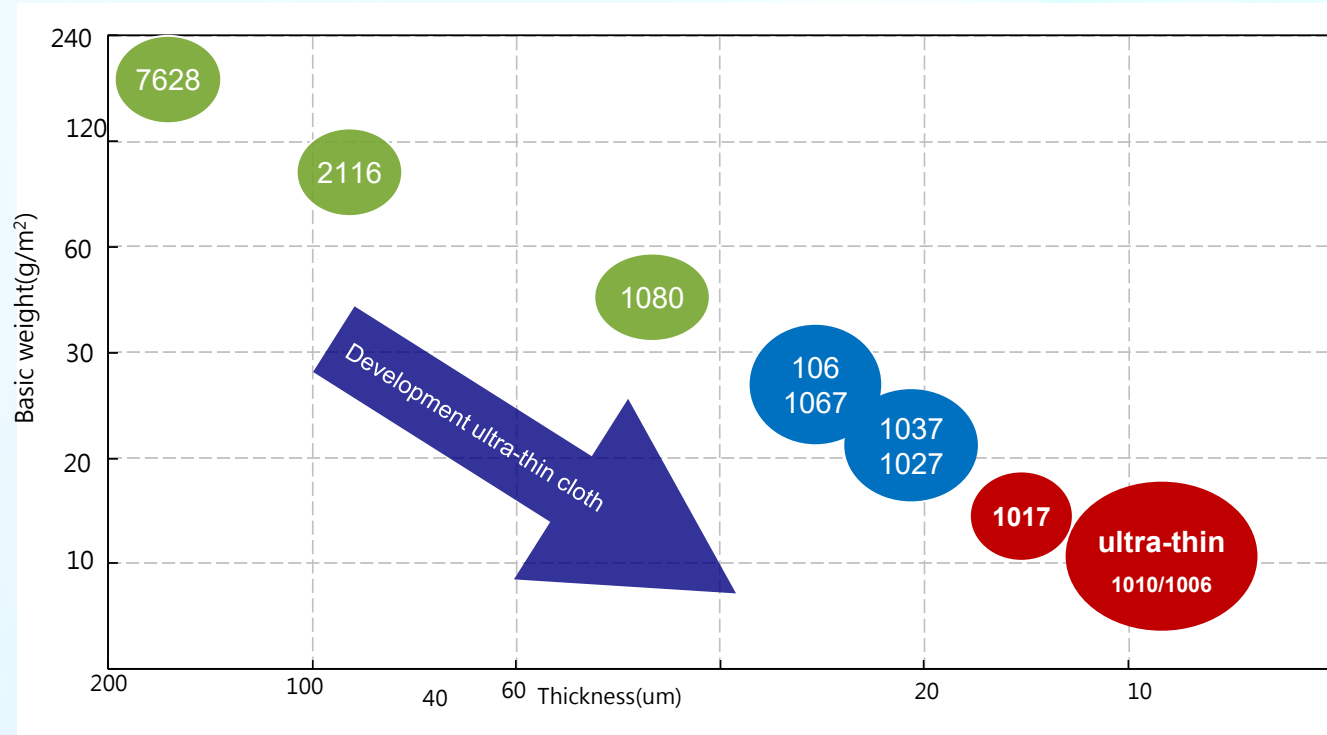


Product Applications – Fiberglass Fabric

Classification	Low-CTE (TS Glass)	Low-DK (TD/TDA GLASS)	E-glass (Ultra-Thin Fabric)	E-glass
STYLE	1010~2118	1010~2116	1017、1027、1037	1035 ~ 7628
Thickness (mm)	0.011 ~ 0.098	0.011 ~ 0.090	0.014、0.019、0.027	0.028~0.170
Basic Weight (g/m ²)	10.1 ~ 114.0	9.0~ 92.0	12.3、19.9、23.0	30~210
Description	Used to produce low thermal expansion substrates, primarily applied in IC substrates.	Used to produce high-frequency and high-speed substrates, applied in high-end electronic products such as low Earth orbit (LEO) satellites, 5G base stations, and cloud data center routers, switches, and servers.	Applied in high-end 5G smartphones and next-generation products from companies such as Apple and Samsung.	Smartphones, base stations, servers, and other 5G wireless communication and Internet of Things (IoT) devices. Automotive circuit boards, laptops, and 3C electronic products.



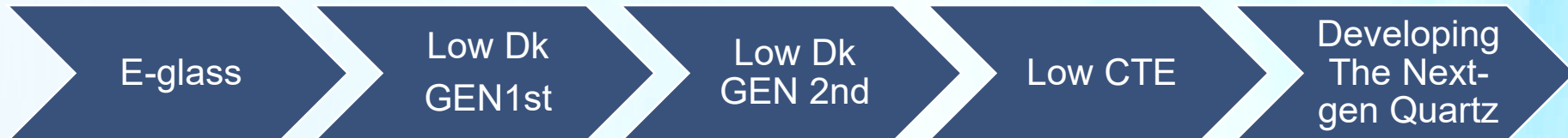
Trend Toward Thinner Thickness



Why Must Thickness Be Reduced?

- Accommodating More Routing Layers
- Compressed End-Product Space
- Signal Integrity Requirements

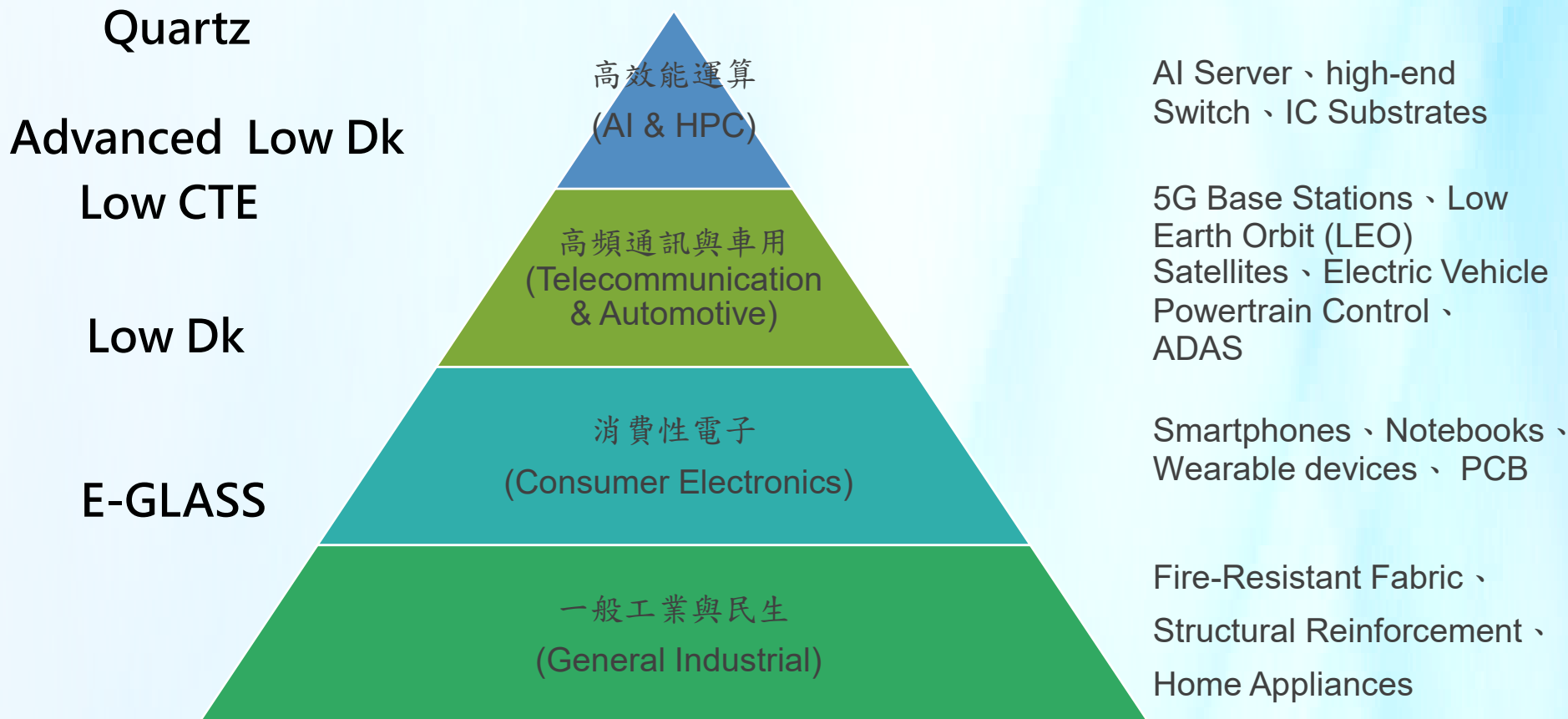
Development in glass Fabric fro TGI



Item	E-Glass	LDK-1	LDK2	L-CTE	Quartz
Dk (10GHz)	6.3	4.6	4.3	5.0	3.8
Df (10GHz)	0.0060	0.0024	0.0019	0.0040	0.0002
CTE (ppm /°C)	5.4	3.5	3.1	2.5	0.5



Product Applications – Fiberglass Fabric



~ Thank You ~