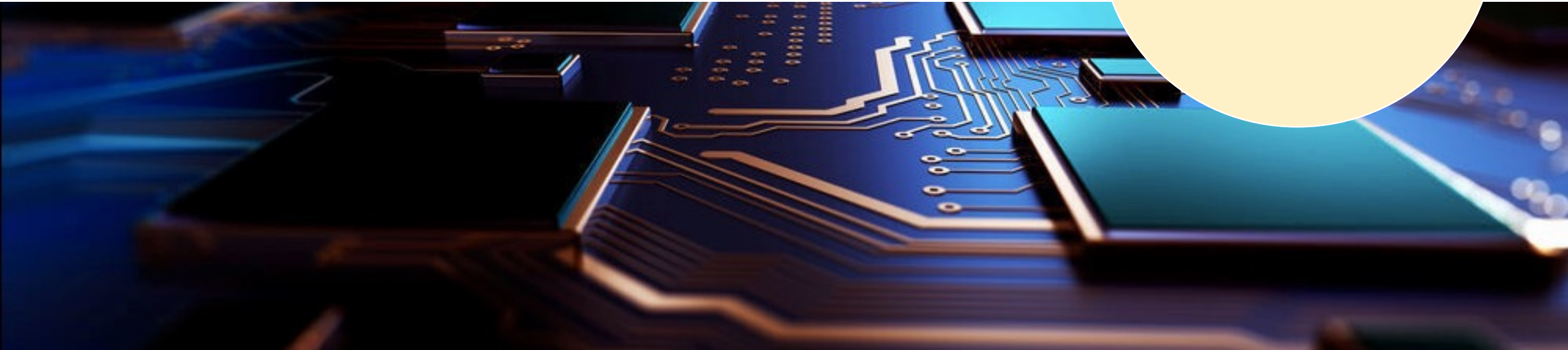
THAILAND PRINTED CIRCUIT ASSOCIATION

THPCA

THAILAND PRINTED CIRCUIT ASSOCIATION

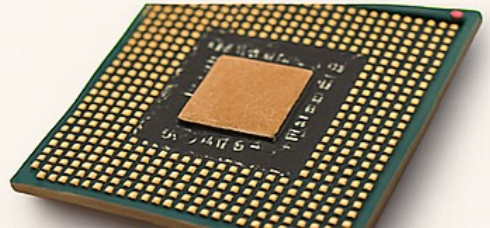


Index

Market Value Semiconductor

USD 578 Billion

≈ 21 Trillion THB



Market Value PCB

USD 69.5 Billion

≈ 2,5 Trillion THB

Workforce Efficiency Comparison: PCB vs. Semiconductor

📉 **PCB Industry**

•**Nature**: Manpower-intensive

•**Labor Dependence**: High (manual processes like imaging, drilling, plating, inspection)

•**Revenue per Employee**:

▶️ USD **100K – 150K/year**

•**Typical Factory Profile**:

▶️ **500–2,000 employees**

▶️ **USD 50M – 200M** revenue/year

Leading-edge semiconductor fab (e.g., TSMC 5nm/3nm):

•**Highly automated & specialized**

•**Typical direct fab operations staff**:

▶️ **1,000–3,000 employees per fab**

(not including corporate, R&D, or other offsite roles)

•**Revenue per fab**:

▶️ **USD 5B – 10B+** per year

▶️ **USD 1M+ per employee** possible

WECC
World Electronic Circuits Council

CPCA
中国电子电路行业协会

eipc

ELCINA
50 years of dedicated service

HKPCA
Hong Kong Printed Circuit Association
香港綫路板協會

IPC

IPCA
Indian Printed Circuit Association
Design • Manufacture • Assembly • Training
ELECTRONICS
WWW.IPCAINDIA.ORG

JPCA
Japan Electronics Packaging and Circuits Association

KPCA
Korea Electronics Packaging and Circuits Association

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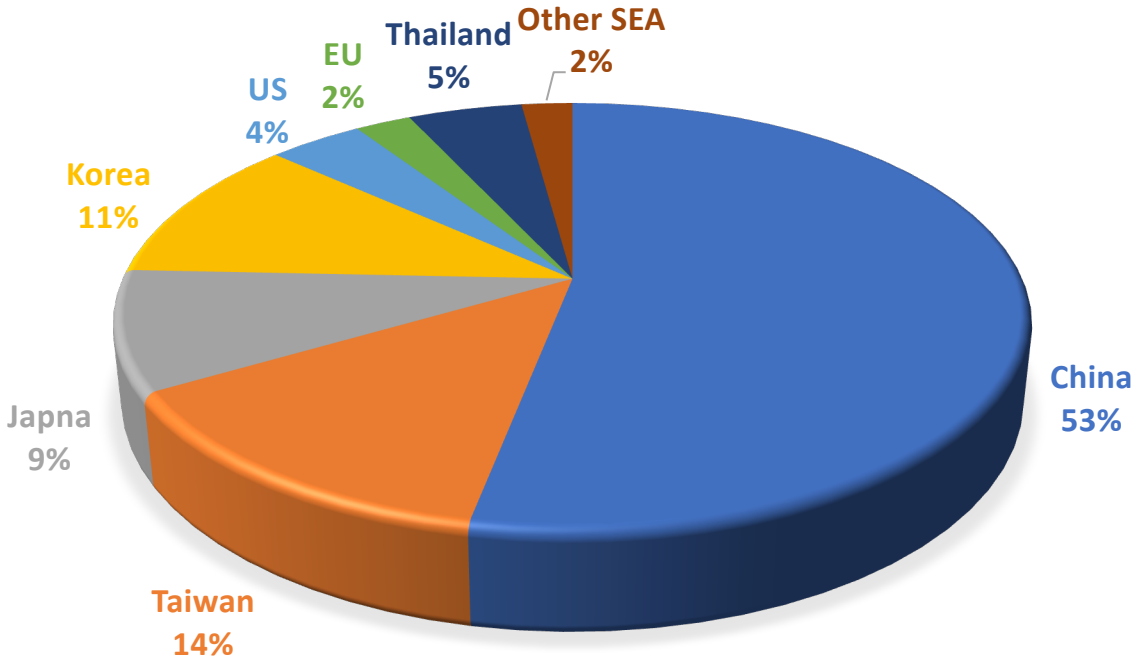
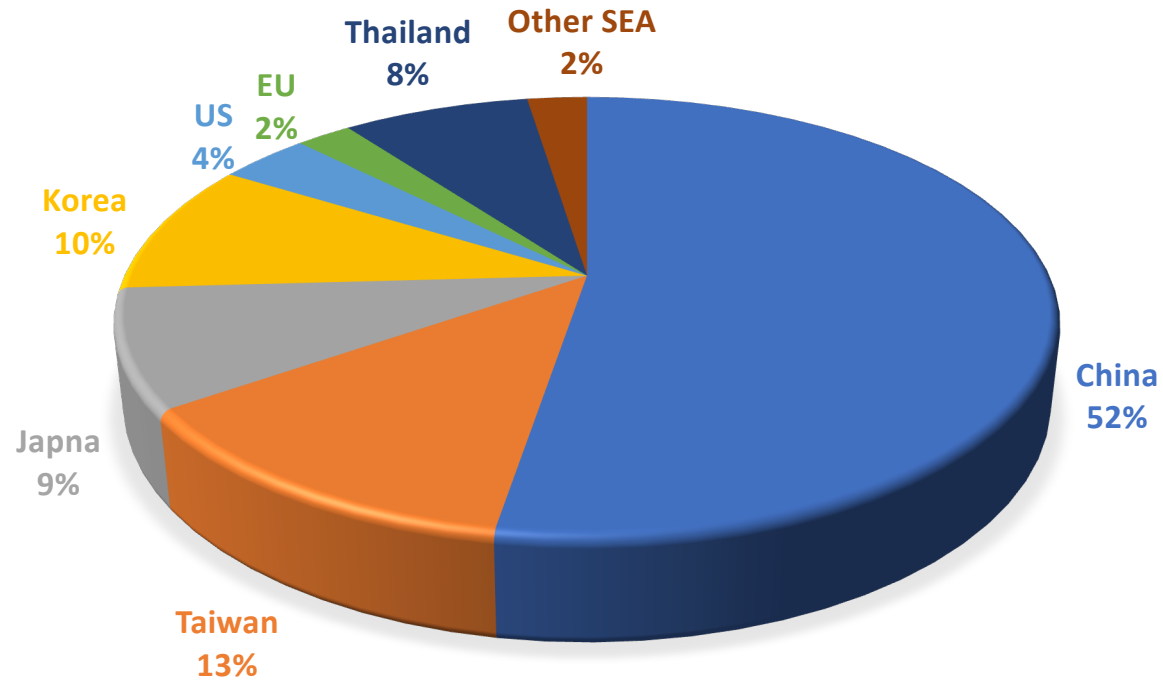
TPCA 台灣電路板協會
Taiwan Printed Circuit Association

2023 PCB PRODUCTION VALUE



Total: $83,256

ESTIMATE 2026 PCB PRODUCTION VALUE



Total: $103,759

Thailand's PCB in 2023 exports account for 5% of the global market, totaling 1.4 billion USD.

First Phase: In the next two years, it is expected that Thailand's PCB exports to global will increase to 10-15%, reaching a total of approximately 6-8 billion USD.

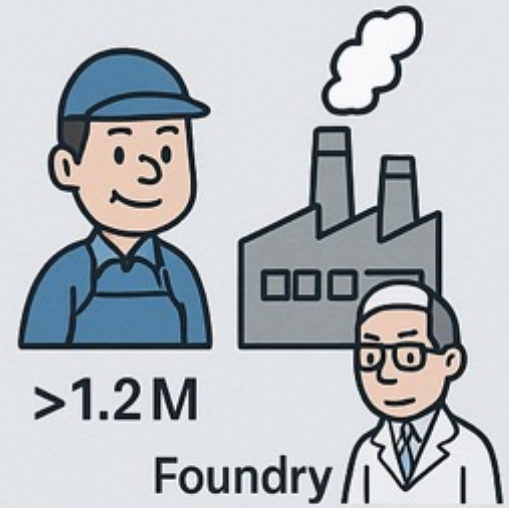
Second Phase: 2027 the possibility of Thailand PCB industry will growth expand to 20-25%, 18-25 billion USD.
Challenge: Invite high technology electronics Devices Assemblers (ESM), Lead frame , Connector and ect.

Characteristics of PCB Industry

- This is an Asian business.

PCB industry generally create more jobs

- A new PCB shop typically require about $50M to $1 Bn investment
- A semiconductor assembly/testing house normally needs $200M to $5Bn
- A new foundry fab CAPEX is more than $10Bn



Medium level of manufacturing technology complexity

Clustering A strong connection to upstream material and tool industries and down stream- board and box assembly operations

THAILAND'S COMPETITIVE POSITION IN THE PCB MARKET

As of 2023, more than $2 billion worth of bare-board PCBs were produced in Thailand, accounting for approximately 3% of global PCB production.
Within Southeast Asia, Thailand has attracted over 50 PCB manufacturers and more than $5 billion in capital to expand multilayer and HDI PCB manufacturing capabilities.
•Additionally, more than $1 billion in new capital is expected to be invested to enhance Thailand's production capacity for PCB materials, tools, and accessories.
•Altogether, approximately 60% of the new PCB investment capital in Southeast Asia has flowed into Thailand.

Key Strengths

– Competitive electricity costs and stable supply
– Experienced and talented human resources
– Stronger infrastructure compared to other SEA countries
– Competitive labor costs and a stable democratic environment

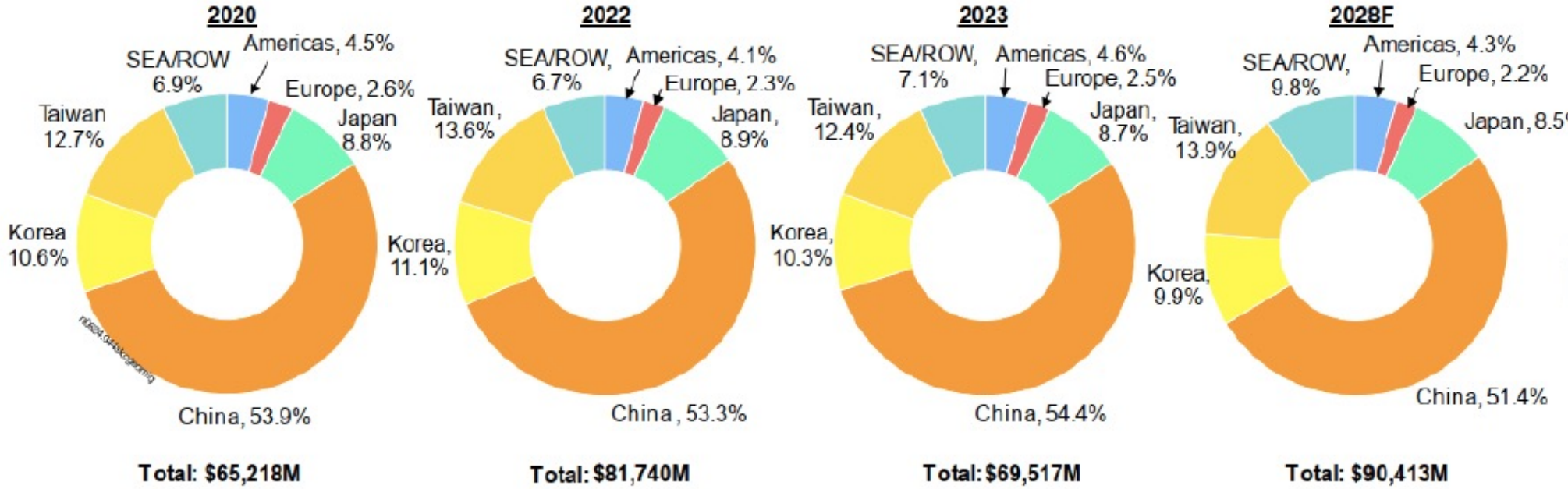
STRENGTHS

•Preferred by Western end customers and favored by Taiwanese and Chinese PCB producers
•Supportive government programs
•Competitively low labor costs

WEAKNESSES

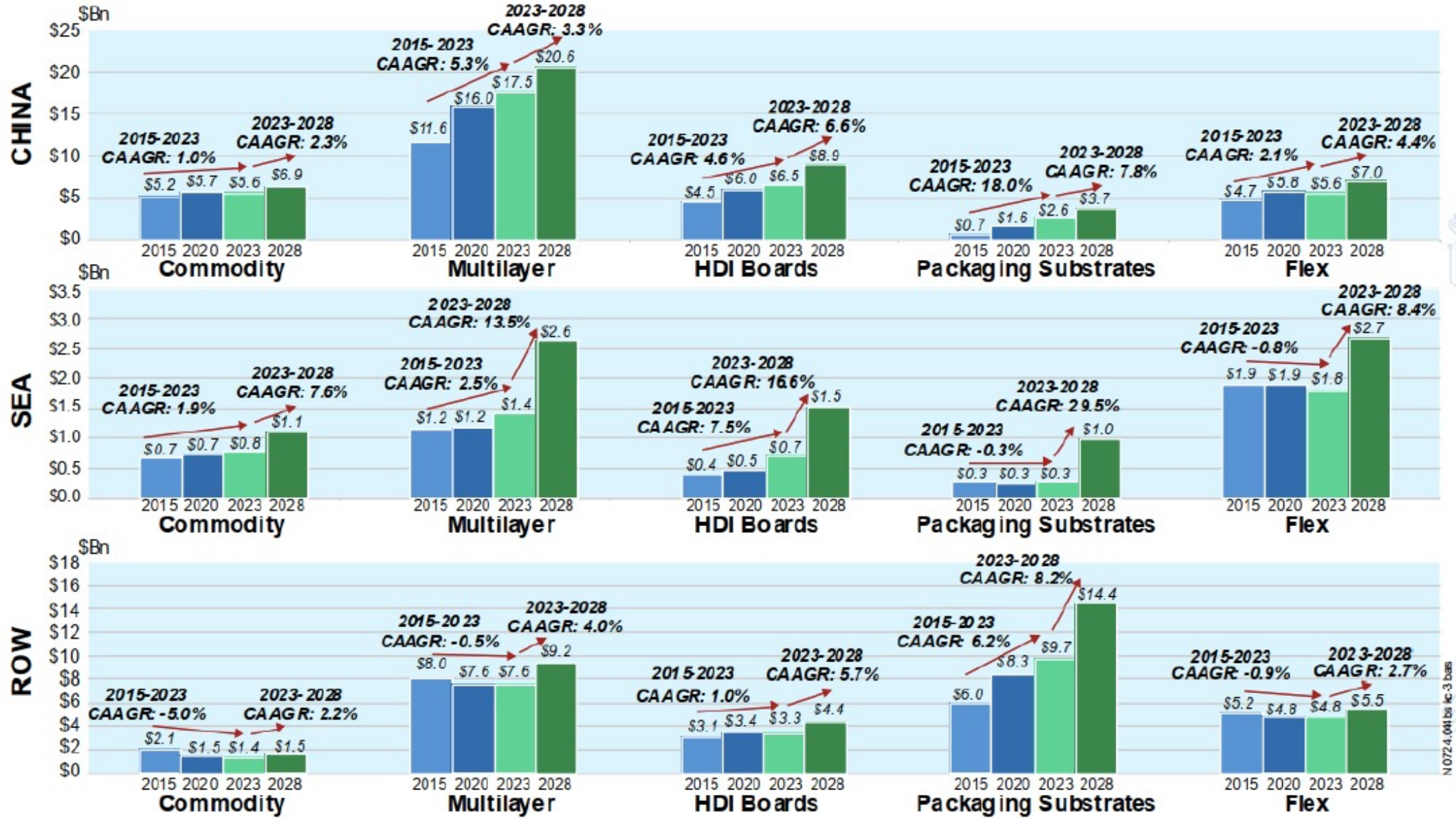
•Higher manufacturing costs than China
•Rising electricity costs and supply risks
•Supply chain gaps
•Shortage of highly specialized human resources

Geographic Migration of PCB Production

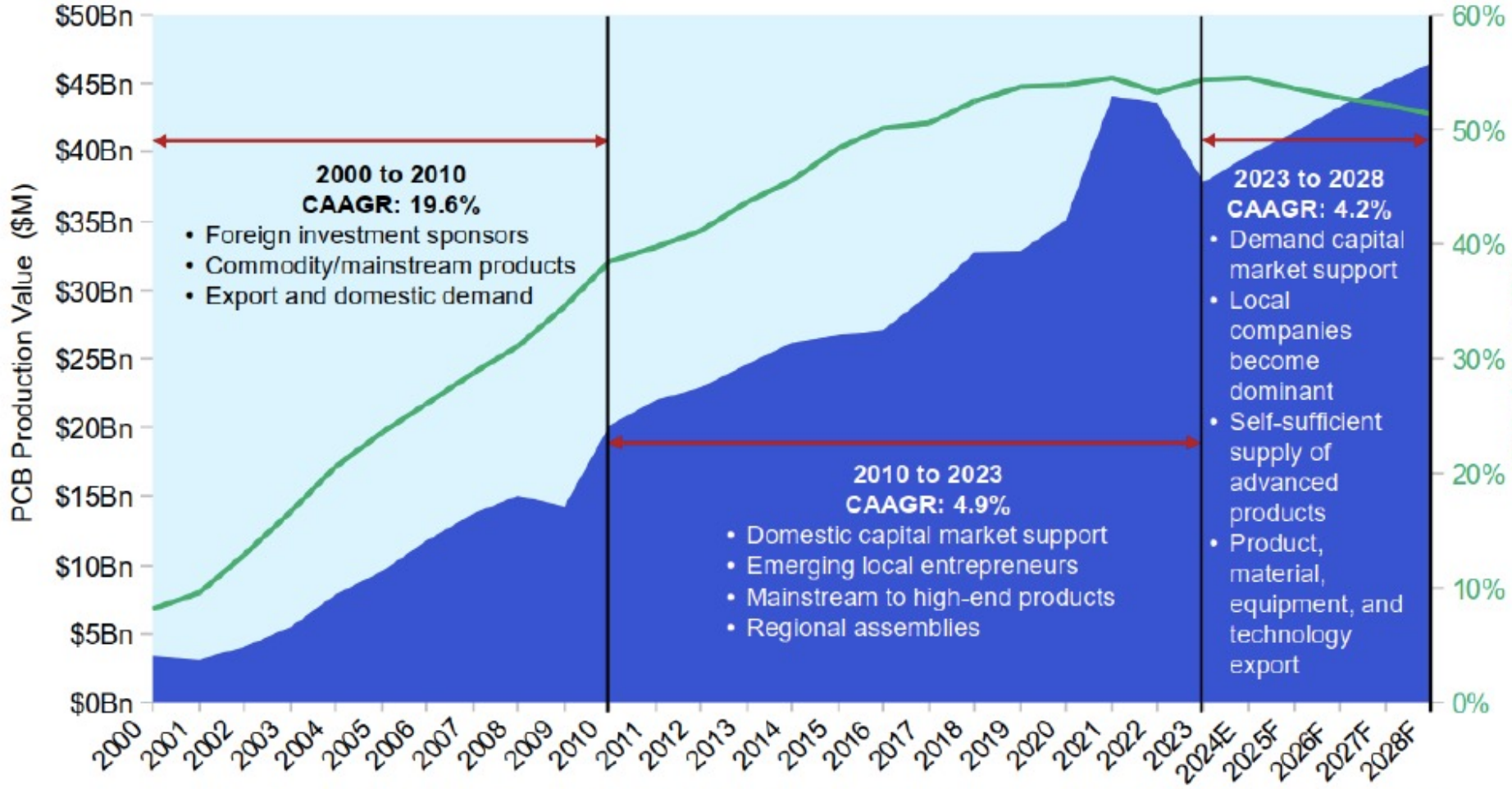


	2000	2020	2022	2023	2028F	2000-2022 CAAGR	2023/2022	2023-2028 CAAGR
Americas	$10,852	$2,943	$3,369	$3,206	$3,875	-5.2%	-4.8%	3.9%
Europe	$6,702	$1,727	$1,885	$1,728	$2,012	-5.6%	-8.3%	3.1%
Japan	$11,924	$5,771	$7,280	$6,078	$7,649	-2.2%	-16.5%	4.7%
China	$3,368	$35,124	$43,553	$37,794	$46,474	12.3%	-13.2%	4.2%
Korea	$2,053	$6,881	$9,052	$7,187	$8,959	7.0%	-20.6%	4.5%
Taiwan	$4,510	$8,266	$11,121	$8,606	$12,547	4.2%	-22.6%	7.8%
SEA/ROW	$2,161	$4,507	$5,481	$4,917	$8,898	4.3%	-10.3%	12.6%
Total	**$41,570**	**$65,218**	**$81,740**	**$69,517**	**$90,413**	**3.1%**	**-15.0%**	**5.4%**

PCB Supply Chain Transformation



PCB Manufacturing Industry Development In China



	IPO Companies	Initial IPO Capital (RMB Bn)	Total Capital from Equity Market (RMB Bn)
PCB	42	33.2	97.6
Material	25	22.8	45
Equipment	8	6.6	13.2
Environmental	2	2.9	4.1
Total	**77**	**65.4**	**159.8**

Source: CPCA, Prismark

0724.044skc

THAILAND PCB INDUSTRY GROWTH OPPORTUNITIES

Recent investments in PCB manufacturing in Thailand have been primarily driven by geopolitical tensions.

Opportunities: AI servers, networking, and automotive applications
This wave of investment could help Thailand become one of the top three PCB manufacturing locations in the next 3 years:

- Recent investments could potentially double or triple PCB production output in Thailand within the next five years.
- A clustering effect is emerging in Thailand, with leading PCB manufacturers increasingly committed.
- Many leading Western electronics OEMs favor establishing new PCB production sites to diversify risk.
- A new “out-of-China” PCB manufacturing hub is in demand, and Thailand may be the optimal choice.

However, recent investment alone does not guarantee long-term sustainability or future growth. Without adequate returns on investment or sustained competitiveness, leading PCB companies may slow future investments or seek alternative sites and opportunities elsewhere.

Critical Success Factors in PCB Industry Development

Government support: taxation, water, electricity, and land supply
Sufficient and low-cost electricity and water supply are critical.

Human resources: enlarge and develop talent pools
•Collaborate with local vocational schools, universities, and research/development centers.
•Work with global leading manufacturing tool and material suppliers.
•Enhance exchange programs with development organizations in other countries.

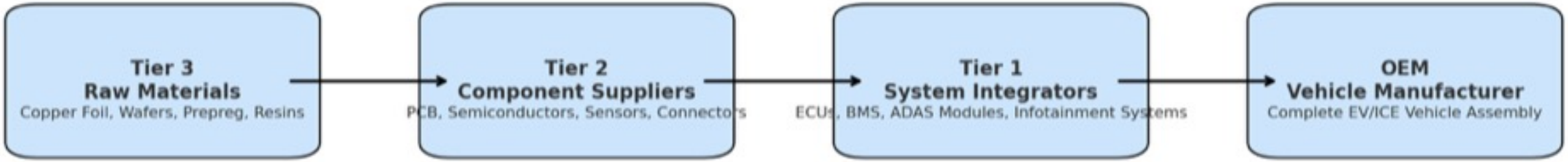
Capital market: access to local financial institutions and equity markets
•The PCB industry is capital intensive.
•Strong growth cannot happen without the injection of new capital.

Local entrepreneur participation
•The PCB industry can never grow without local roots.
•Growth of local companies should be supported by local forces.

To expand and grow the upstream and downstream industries
•PCBA, module, and box assembly
•Electronics materials and manufacturing equipment

In 2022-2024, investment promotion applications totaled 406 projects with a combined investment of 18 billion USD.

Source: BOI



Tier 3 includes raw material suppliers (e.g., copper foil, prepreg, wafer foundries).

These suppliers form the **foundation** of the electronics supply chain and feed into Tier 2 manufacturers.

- TSMC
- LUVATA
- Furukawa
- King Board
- Misui
- Atotech

Electronic components, such as:
•PCBs and substrates
•Semiconductors (MCUs, power ICs, sensors)
•Wire harnesses and connectors
•Passive components (capacitors, resistors, inductors)
•Custom IC packaging and module assembly
Materials and manufacturing services for Tier 1 integration.

- **PCB: Unimicron, Compeq, Meiko**
- **EMS: Foxconn, Pegatron, Delta Electronics**
- **Semiconductor: Infineon, NXP, ON Semiconductor, Renesas, STMicroelectronics**
- **Components: TE Connectivity, Molex, Murata, Rohm**

Complete **electronic systems or modules**, such as:
•Infotainment systems
•ADAS platforms (camera + radar + software integration)
•Powertrain control units
•Body control modules
•Instrument clusters or digital dashboards
•EV battery systems
They integrate **PCBs, semiconductors, software, and mechanical housing** into ready-to-install assemblies.

Tier 1s often handle **software development, safety compliance (ISO 26262)**, and **system-level testing**.

Bosch
Continental
Denso
ZF
Aptiv
Visteon
Panasonic Automotive
Valeo
Hyundai Mobis

- Toyota
- Honda
- Tesla
- Ford
- Mercedes
- BMW
- Audi
- BYD
- Nissan
- TATA
- Mitsubishi

MILESTONES

2019
Established

2020
WECC Member

2021
Cluster & SME Development Market Survey

2022
People& Supply chain Development

2024-2027
Estrablish Thai PCB Institute

THPCA
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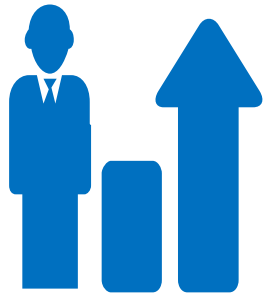
WECC
World Electronic Circuits Council



About us/Vision & Mission

Thailand Printed Circuit Association was founded in 2019 by Thai companies with a common purpose to contribute and improve electronics circuit and relate industries in Thailand.

Vision

To participate in development of Thailand PCB industry as strategic positioning in the global electronic device supply chain

Mission

- People development
- Technology advancement with strong base of research and development
- Supply chain development
- Carry out strategic R&D activities in collaboration of industry or cluster group, Research groups and potentially government agencies

- Relationship building and networking amongst the members and international associates

OUR TEAM

Mr. Pitharn Ongkosit
President

(From KCE Electonics PLC)

Dr. Sharnon Tulabodi
Vice President

(From Gravitech Thai (Thailand) Co., Ltd.)

Mr. Somkurn Chycilaparungroung
Director

From Summit Electronic Component Co., Ltd.)

Mr. Swaek Prakitritanon
Vice President & General Secretary

(From Auromex Co., Ltd.)

Mr. Pornpisit Nitisupornrat
Director

(From Circuit Industries Co., Ltd.)

Mr. Supachak Manutsathit
Director

(From Team Precision Public Co., Ltd.)

OUR TEAM

Treasurer
Ms. Naphaporn Kaewtongsuk

Mr. Chanin Khaochan
Honorary Advisor

BOI

Mr. Daniel Primett
Technical Committee

Assoc.Prof.Dr. Suraphan Yimman
Honorary Committee

Faculty of Applied Science
King Mongkut's University of Technology
North Bangkok

Panavy Pookaiyaudom (PhD, DIC, Asst. Prof)
Honorary Committee

Mahanakorn University of Technology

David Bergman
Honorary Committee

IPC Inc

THPCA Activities and Achievements

Business Development

- Building and networking amongst the WECC
- Provide identification and aftercare by providing promotional platforms:

Government Liaison

- Configurations influence the way to promote and facilitate investment
- Policy advocacy in the PCB Industry

Cluster & SME Development

- Develop long term partnership Provincial and cluster level

Market & Industrial Survey

- Monitoring and evaluation key electronics system
- Analysis Market
- Study on future grow opportunity
- Generate technology road map by technology mapping study

Thailand Electronics Circuit Center (TECC)

- People development
  - Training Center, Up-Re Skill
  - PCB hand on training
- Local supply chain development
- PCB Prototype shop

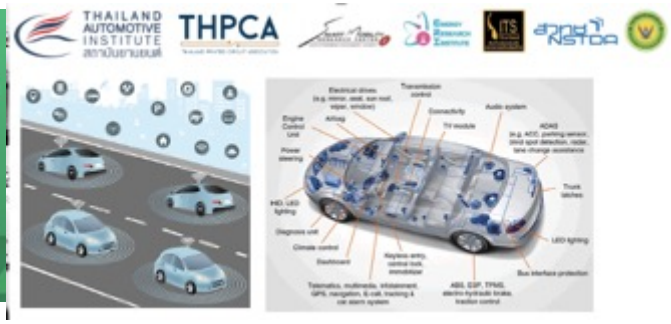
Sample Activity

Business Development

People/Technical Development

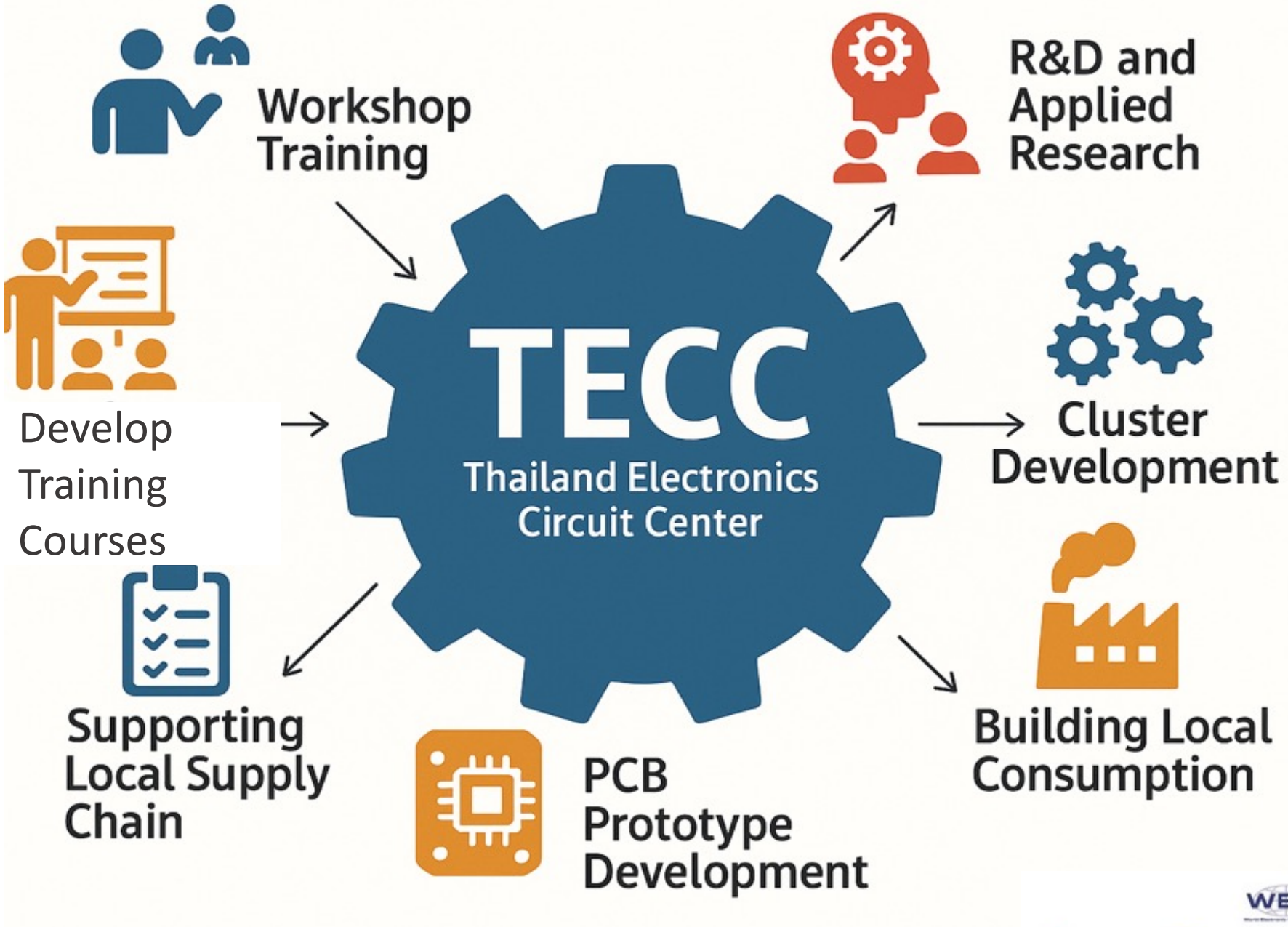
Government Liaison

Cluster & SME Development



Market & Industrial Survey


Hosted Organizer
Organizer
THPCA
Co-Organizer
HKPCA
Media Partner
THECA
How to Effectively Build
a Future Electronic Ecosystem
THAILAND
ELECTRONICS
CIRCUIT
ASIA 2025
WEBSITE
sponsored by
https://thailandelectronicscircuitasia.com
https://thpca.org
phutana@thpca.org / kanlaya@thpca.org
(+66) 89 987 9701,(+66) 97 172 7333
20-22 Aug 2025
BITEC EH 99-100
BANGKOK,THAILAND



Operate by

THPCA
THAILAND PRINTED CIRCUIT ASSOCIATION

TISTR
สถาบันวิจัยวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย
THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH

Supported By

WECC
CPCA
ELCINA
HKPCA
IPC
JPCA
KPCA
THPCA
TPCA

Establish Thailand Electronics Circuit Center

Thailand PCB Industry Growth Opportunities

Recent Investments and Opportunities:

•**Geo-political Tensions:** Recent investments in Thailand's PCB manufacturing are driven by geopolitical tensions.

•**Applications:** Key growth areas include AI servers, networking, and automotive applications.

Potential for Growth:

1.Top Global Player: Thailand could become one of the top three PCB manufacturing sites within the next 10 years due to recent investments potentially doubling or tripling production output in the next 5 years.

2.Clustering Effect: A clustering effect is emerging with increased commitment from leading PCB manufacturers.

3.Diversification for OEMs: Many leading Western electronics OEMs prefer new PCB production sites to diversify risk.

4.Alternative to China: Thailand is an attractive alternative to China for PCB manufacturing.

5.Alignment with Electronics Applications: The industry's development aligns well with growing electronics applications such as AI servers, data centers, satellite communications, and automotive electronics.

TECC

Operated by

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THAILAND PRINTED CIRCUIT ASSOCIATION

TMEC
Thai Microelectronics Center

Challenges and Sustainability:

•**Investment Returns and Competitiveness:** Long-term sustainability and growth depend on adequate investment returns and sustainable competitiveness. Without these, leading companies may slow down future investments or seek alternative sites.

Key Factors for Sustaining Growth:

1.Government Support: Taxation, water, electricity, and land supply need to be addressed. Sufficient and low-cost electricity and water supply are critical.

2.Human Resources: Enlarging and developing talent pools by collaborating with local vocational schools, universities, and research/development centers.

3. Coordination hub between Local & Global Partnerships: Collaborating with leading manufacturing tool and material suppliers globally.

4.International Exchange Programs: Enhancing exchange programs with development organizations in other countries.

5.Capital Market Access: Ensuring access to local financial institutions and the equity market as the PCB industry is capital intensive.

6.New Capital Injection: Strong growth necessitates new capital investments.

7.Local Entrepreneur Participation: Growth requires participation from local entrepreneurs.

8.Prototyping Factory to Support for Local Companies: Supporting the growth of local companies through local initiatives.

9.Upstream and Downstream Expansion: Expanding industries like PCBA, module, and box assembly.

10.Electronics Materials and Equipment: Development of electronics materials and manufacturing equipment is crucial.

TRAINING ACTIVITY OF THAILAND PRINTED CIRCUIT ASSOCIATION (THPCA)

Objective

To build a skilled workforce for the PCB and Advanced Electronic industry in Thailand through upskilling, and industry-academia collab-

Key Partnerships

University (MUT, KMUTT, KMITL, Khon Kaen Univ.)
BOI, NXPO, DEPA
Global partners (IPC)
WUS, Amitron

Program Formats

- TECC (Thailand Electronics Circuit Center)
- Partner university labs
- On-site factory visits

TRAINING DOMAINS

PCB Design & Simulation
- CAD tools (Altium, KICAD) Signal integrity, and thermal managememt

PCBA and EMS
- SMT line Operation
- Reflow Soldering &inspection
- Manual Soldering Skills

Industry 4.0 & Smart Manufacturing
- Factory Automation
- Data Analytics

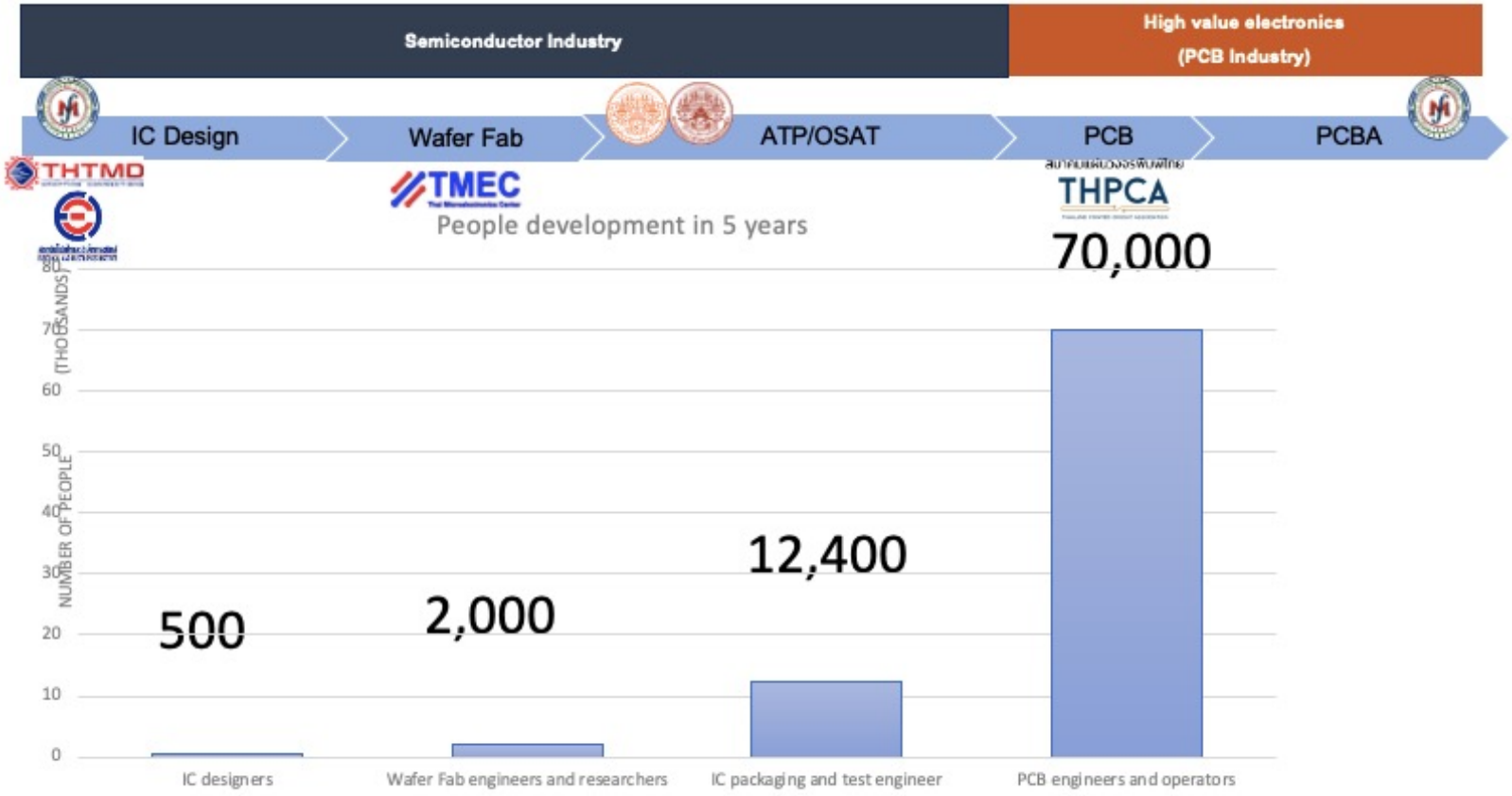
Workplace Readiness & Soft Skills
- ESD Awareness
- Team Collaborating & Communication
- Safety Practices

Impact (2025–2027)

- -1.200+ Trainees
- -60+ Partner Companies
- -26+ Technical Modules Delivered

70,000+ Positions

Strategic Mechanisms for Semiconductor Workforce Development and Capability Enhancement



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Semiconductor Industry | **PCB Industry**

IC Design → Wafer Fab → ATP/OSAT → PCB → PCBA

THTMD · TMEC · THPCA

Examples of Industry Collaboration Across the Three Training Centers

THPCA · UAC · EIC · ptt · ANALOG DEVICES · infineon · DELTA · MICROCHIP · SPEA · STARS MICROELECTRONICS · NXP · silicon craft

University Consortium

National Training Centers

Missions

KMITL

Centre of Sandbox Curriculum for specialized demand-driven education in Semiconductor Engineering, collaboratively with a University Consortium comprising >1x institutions

KMUTNB

A hub for the domestic semiconductor industry that fosters educational collaboration through shared resources, industry expert engagement, and cutting-edge equipment donations from corporate partners

MUT

- Global semiconductor alliances optimize expertise and resources.
- Shared specialists accelerate innovation capabilities.
- Jointly developing curricula and research initiatives training center

Examples of Collaboration with Leading International Higher Education Institutions by MUT

Imperial College London — Centre for Bio-Inspired Technology

ASU Arizona State University — National Semiconductor Technology Center (NSTC) & Advanced Packaging Piloting Facility

University of Southampton — Zepler Institute for Photonics and Nanoelectronics

UNSW

Output :

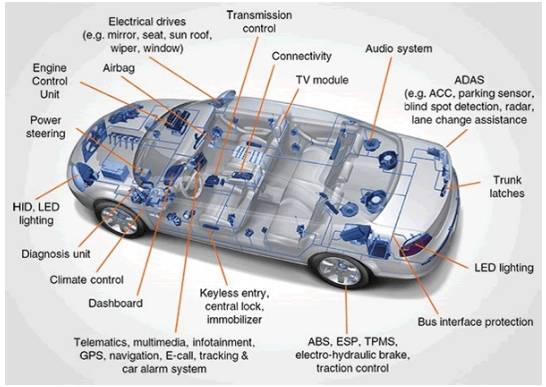
- Curricula Co-creation/ Demand-driven
- Short Courses (Skill Certificate)
- Train the trainers
- Co-research
- Prototypes
- Deep Tech Startups/ Spin-off

Source: NXPO, PSO

Cluster & SME Development

SEGUMO

Dep: Connected Autonomus Vehicles (CAV)



Beverly

E- Textiles for a Smart Bed consists on a set of sensors fully screen printed on a Fabric Sheet Cover based on Mattress Mat by Sensing Tex. It is a System developed for multiple applications for body pressure, temperature, moisture and Bio signals in bedding. It can be used for product in health, wellness for bedding applications such as measure and monitor user position, evaluate user comfort, identify pressure on risk areas, measure position for wellness purposes, tracking of respiration and heart rate, temperature and moisture Sensing among other applications.

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THAILAND PRINTED CIRCUIT ASSOCIATION

THANK YOU!

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