

A detailed microchip is centered on a blue-toned circuit board. The chip has a grid of pins and a central square area with some markings. The background is a complex network of circuit traces and nodes, illuminated with a soft blue glow.

TAEWON ENTERPRISE

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Chips & Future

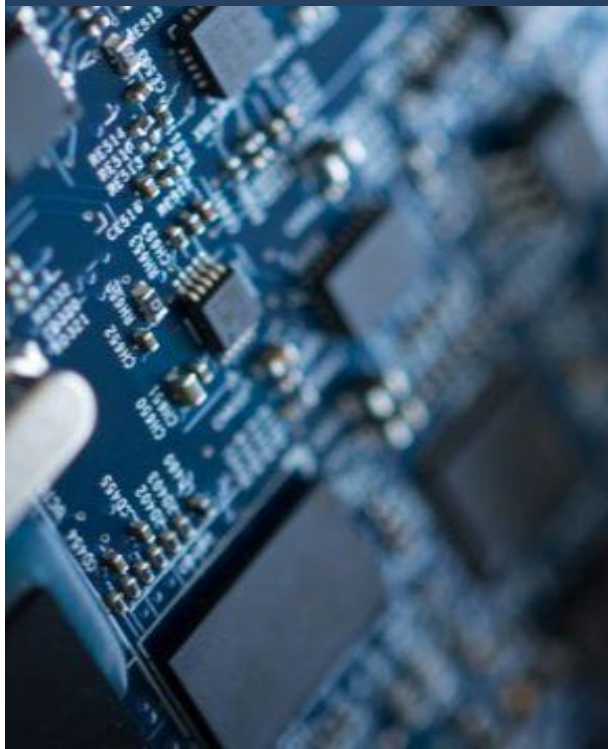
CnF, KOREA



# 01

## About Us

- Patent Status



## Content about Patent Registration

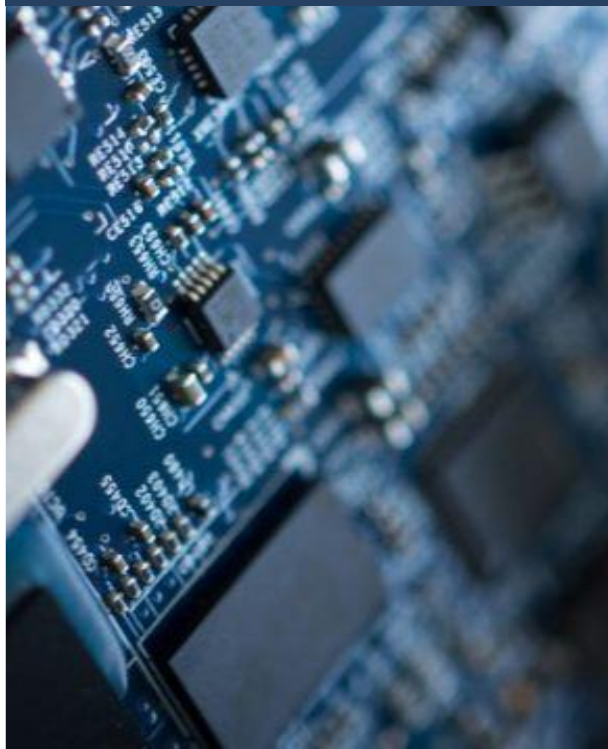
No.	Patent Name	Patent Content	Notes
1	PAM4 type high-speed transmission/reception circuit device	<ul style="list-style-type: none"><li>Patent for PAM4 transmission/reception circuit capable of two-way transmission/reception that integrates a transmission circuit and a reception circuit in a PAM4 circuit device used in a high-speed optical communication circuit</li></ul>	Patent Registration
2	Transceiver circuit device for wireless-optical repeater	<ul style="list-style-type: none"><li>The transceiver circuit device for a wireless-optical repeater uses a single up-down mixer, That features can modulate an RF signal into an IF signal or an IF signal into an RF signal.</li></ul>	
3	Transceiver circuit device for smart wireless-optical repeater	<ul style="list-style-type: none"><li>The transceiver circuit device for smart wireless-optical repeater uses a single up-down mixer, That features can modulate an RF signal into an IF signal or an IF signal into an RF signal.</li></ul>	



# 02

## Business Introduction

- Business Overview
- Product Introduction
- Development Schedule
- Business Competitiveness



# Business Overview

## Main Business Area

### Phase 1

Development Completed

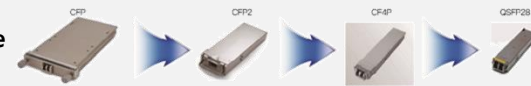
#### IoT-based Wired/Wireless Communication Parts

- IC chip for wired/wireless communication
- Analog IC chip solution

IC Chip



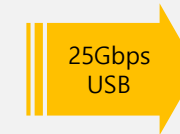
Module



### Phase 2

#### Wired/Wireless Integrated Module

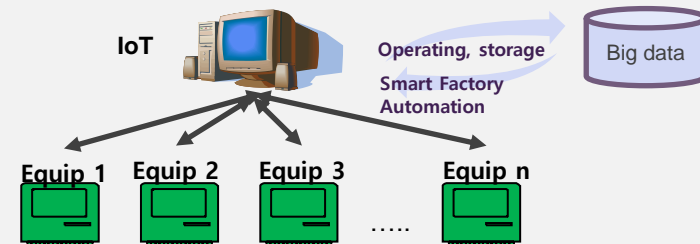
- Module for wired/wireless communication
- Analog IC module solutions



### Phase 3

#### 3S System

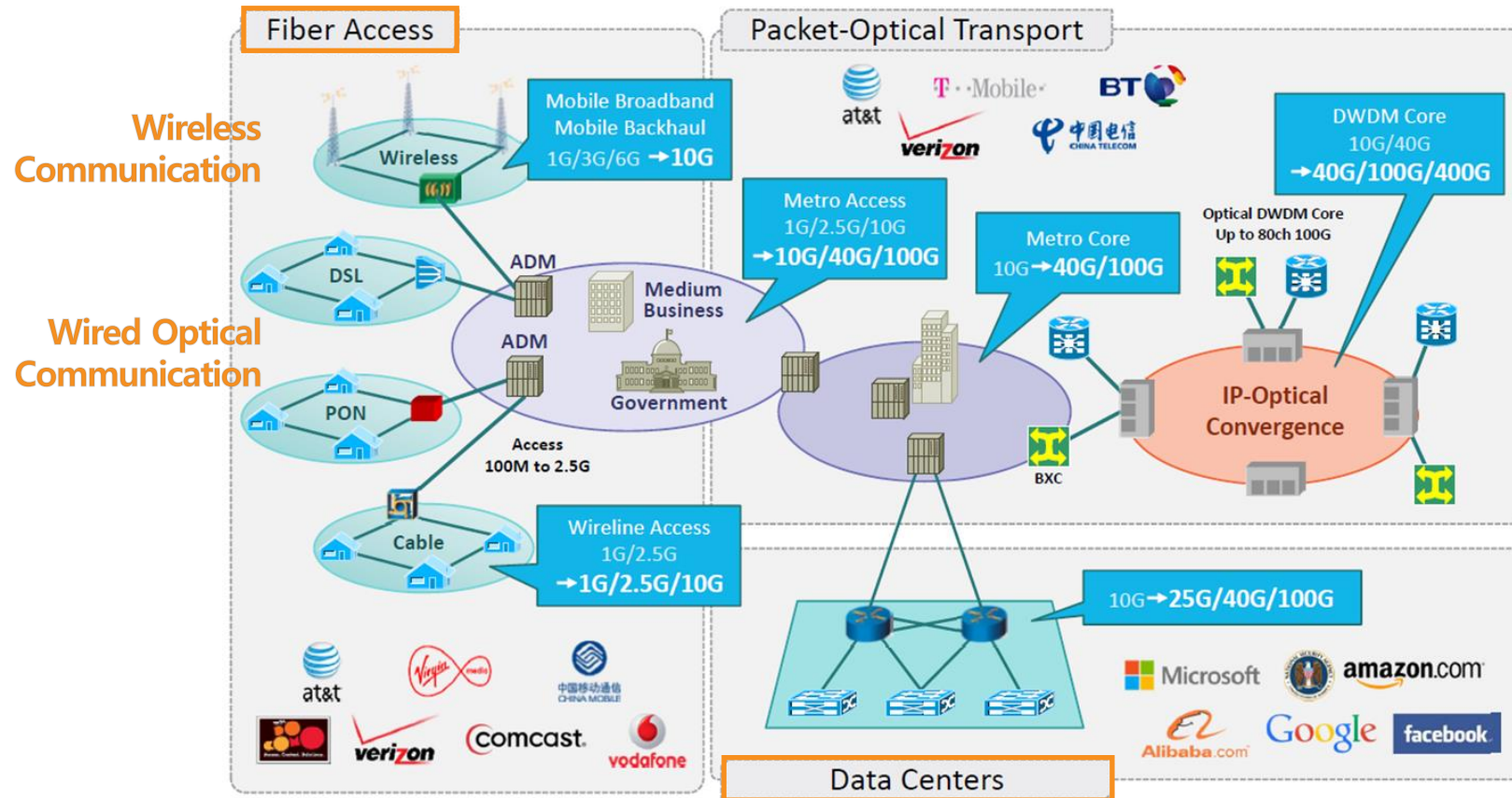
- Integrated module-based system
- Integration of Sensor and MPU
- Embedded software



# Business Overview

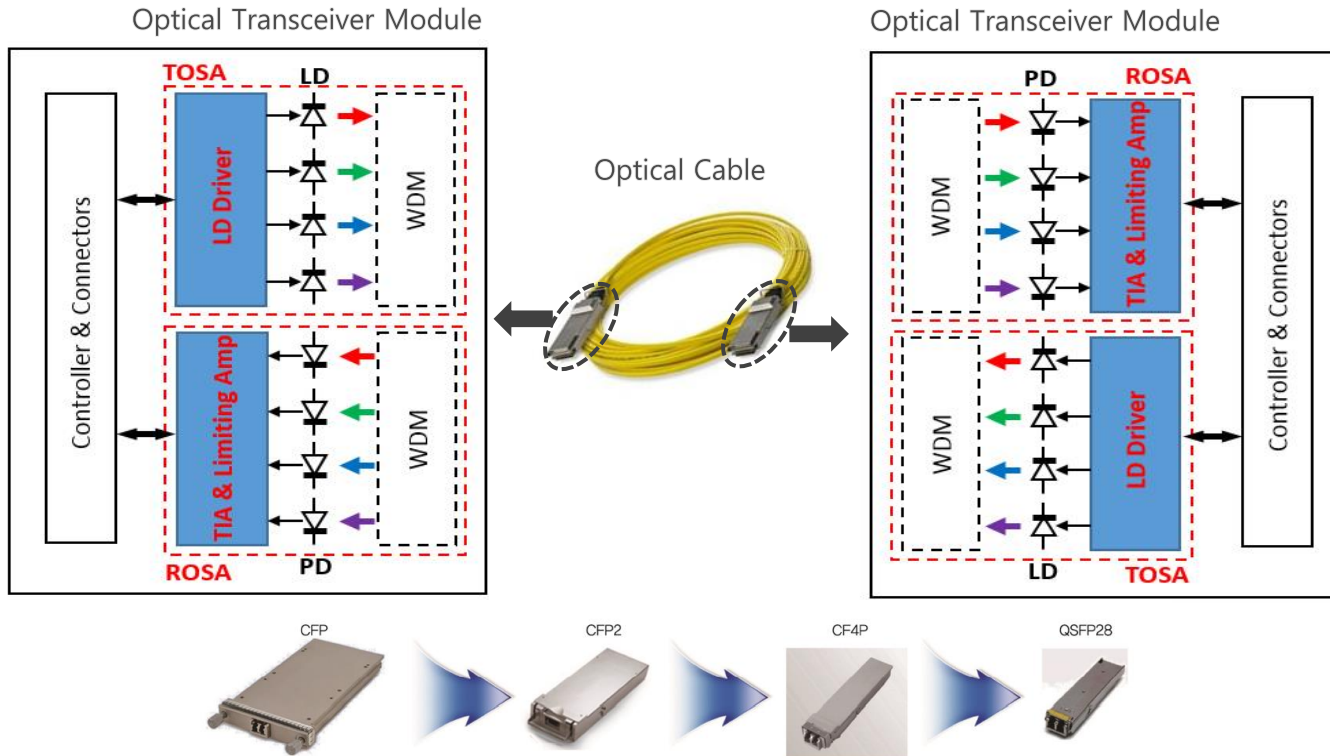
Current Status of Possession of Technology

**Completed development of 100Gbps (4 channels X 25Gbps) hi-tech based optical transceiver IC chip**



Secure technology competitiveness with 100 Gbps (4 channels X 25 Gbps) high-tech based optical transceiver IC chip, and pursue a strategy to preoccupy the market for 5G optical wireless repeater and IoT optical transceiver

## Structure and Standard Package of Optical Transceiver

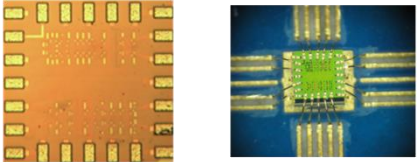
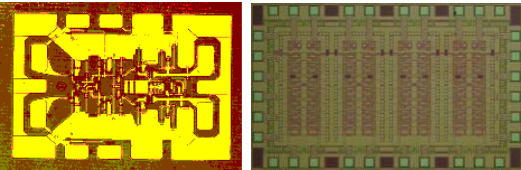
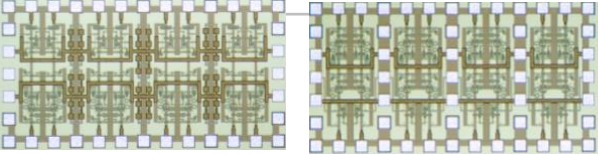


Structure and standard package of optical transceiver

**All optical transceivers consist of TOSA and ROSA.**  
**TOSA consists of a laser diode (LD/VCSEL) and a driving IC (transmission IC),**  
**and ROSA consists of a photodiode (PD) and a receiving IC.**

# Product Introduction

Product in Development Phase 1 – Development Completed/ Commercialization Preparation Phase

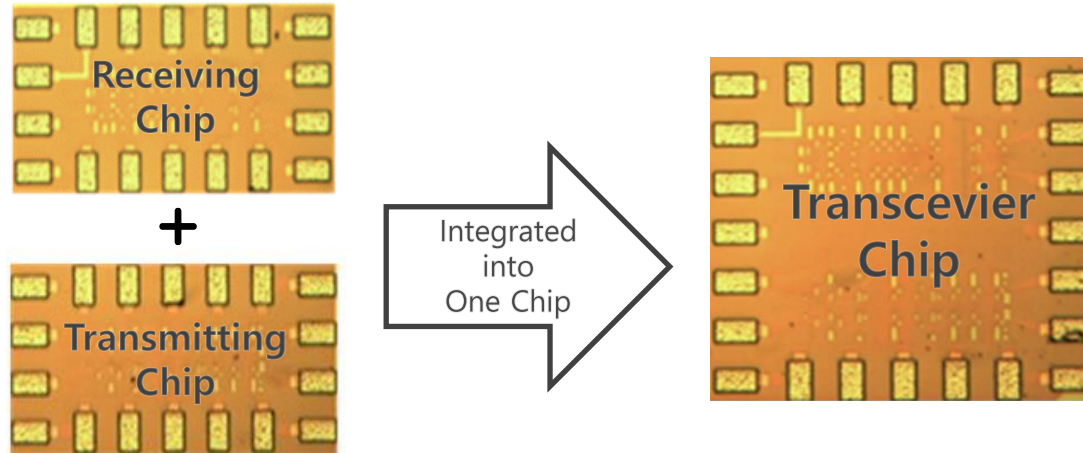
Phase 1	2.5~20Gbps Optical Communication Transceiver IC Chip		
	Items	Details	Notes
20Gbps IC Chip		<ul style="list-style-type: none"> <li>• Support from Ministry of Trade, Industry and Energy for Industry Core Technology Development Project (Korea Advanced Institute of Science and Technology (KAIST))</li> <li>• Smart Consumer Electronics Embedded 20Gbps Ultra-thin Optical Connection Module Development Project (KAIST)</li> </ul>	
10Gbps IC Chip		<ul style="list-style-type: none"> <li>• Ministry of Information and Communication HAN/B-ISDN National Telecommunication Network Project (Electronics and Telecommunications Research Institute (ETRI))</li> <li>• Ministry of Knowledge Economy's industrial convergence source technology development project - Development Project of green data center 40Gbps bidirectional optical connection module for building smart working environment (Korea Advanced Institute of Science and Technology (KAIST))</li> </ul>	
2.5~5Gbps IC Chip		<ul style="list-style-type: none"> <li>• Ministry of Science and Technology's 21st Century Frontier Project. Tera-level Nano Device Development Project (Korea Advanced Institute of Science and Technology (KAIST))</li> </ul>	



Product in Development Phase 1 – **Development Completed/ Commercialization Preparation Phase**

Phase 1

**Bidirectional transceiver IC chip for 100G data center, 25Gbps x 4 channels**



## Advantages & Differentiation

- 30% reduction in chip area → **Cost Reduction**
- 30% reduction in power consumption → **30% Increase in Battery Life**
- Simplifying chip packaging → **Packaging Cost Reduction**

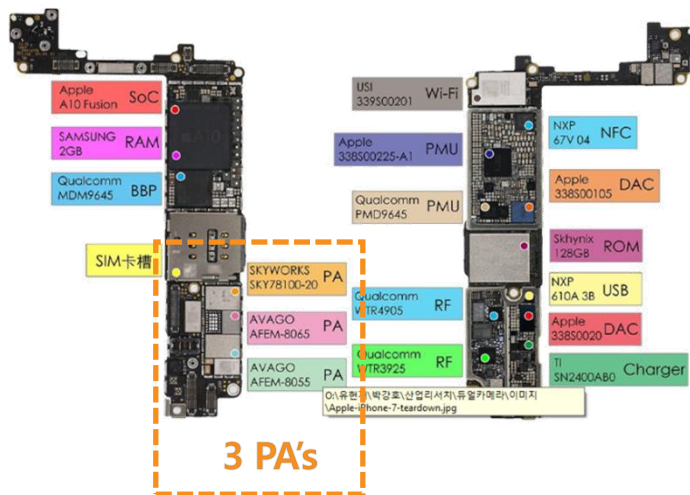
# Product Introduction

Product in Development Phase 2 – Scheduled to Develop from the second half of 2021 to 2022

Phase 2

3 PA's

[List on Apple iPhone 7 parts suppliers]



삼성전자 플래그십 모델별 부품 원가 추정

모델명	갤럭시S7	갤럭시S6	갤럭시S5	갤럭시S4	갤럭시S3
Display/Touchscreen	\$55.0	\$55.0	\$49.0	\$75.0	\$65.0
Integrated Circuit	\$94.3	\$85.0	\$67.0	\$48.0	\$46.5
AP	\$62.0	\$62.0	\$47.0	\$20.0	\$17.5
NAND+DRAM	\$32.3	\$23.0	\$20.0	\$28.0	\$29.0
Power Management	\$9.0	\$8.0	\$10.0	\$9.5	\$7.0
RF/PA Section	\$14.9	\$25.0	\$12.0	\$25.0	\$14.5
User Interface Ics/Sensor Module	\$13.5	\$20.0	\$12.0	\$16.0	\$12.7
Camera Module	\$19.7	\$30.0	\$25.0	\$25.8	\$27.2
WLAN/BT Modules	\$15.7	\$25.0	\$20.0	\$20.0	\$19.0
Battery Packs	\$4.0	\$5.0	\$5.0	\$5.8	\$8.2
Other Noteworthy Items	\$3.7	\$5.0	\$6.0	\$5.6	\$4.9
Mechanical/Electro-Mechanical	\$39.7	\$39.0	\$27.0	\$28.0	\$27.4
Box Contents	\$33.3	\$34.0	\$23.0	\$22.0	\$21.4
Total	\$6.4	\$5.0	\$4.0	\$6.0	\$6.0
<b>Total</b>	<b>\$249.6</b>	<b>\$267.0</b>	<b>\$208.0</b>	<b>\$232.9</b>	<b>\$205.2</b>

자료: IHS, 대신증권 리서치센터

- **3 PA's are wireless power amplifiers for LTE, WiFi, and Bluetooth.**
- **The manufacturing cost of a smartphone is about \$250**
- **The cost of the RF wireless power amplifier is \$15~\$25, which is 6~10% of the total production cost.**
- **The market for high-speed wireless RF chip, which is a key component of 5G and IoT solutions, is expected to exceed \$3billion.**

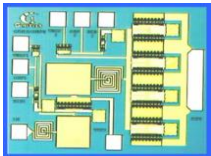
# Product Introduction

Product in Development Phase 2 – Scheduled to Develop from the second half of 2021 to 2022

## Phase 2

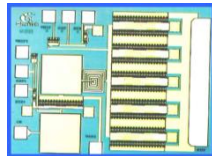
## Development of RF wireless power amplifier IC chip corresponding to 5th generation communication system

### 1. CDMA



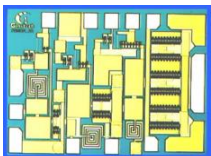
Chip size : 1.2 x 1.3 mm<sup>2</sup>

### 2. GSM



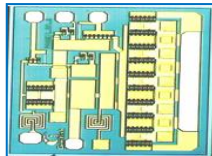
Chip size : 1.6 x 1.2 mm<sup>2</sup>

### 3. PCS



Chip size : 1.5 x 1.2 mm<sup>2</sup>

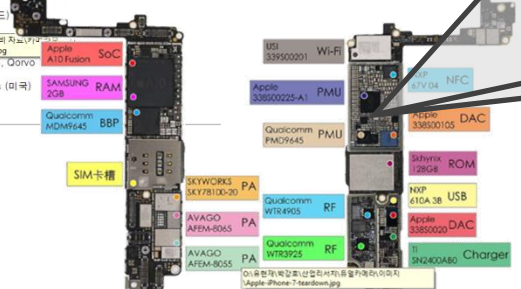
### 4. IMT2000



Chip size : 1.0 x 1.2 mm<sup>2</sup>

### 아이폰7, 부품 공급업체 리스트

메인 새시 조립: Foxconn, Pegatron, Wistron (대만)  
 카메라: LG이노텍, 사프  
 디스플레이: LG디스플레이 (한국), JDI(일본), Sharp (일본)  
 글래스: Corning, Advanced Technology (미국)  
 터치스크린컨트롤러: Broadcom (미국)  
 오디오 칩셋 및 코덱: Cirrus Logic (미국)  
 베이스밴드 프로세서: Qualcomm (미국), Intel (미국)  
 칩셋 및 프로세서: 삼성, TSMC (대만), 글로벌 파운드리 (미국)  
 컨트롤러 칩: PMC Sierra, Broadcom (미국)  
 DRAM: SK하이닉스, 삼성전자, Micron (미국)  
 NAND: SK하이닉스, 삼성전자, Toshiba (일본)  
 가속도계 등 각종 센서: Bosch (독일), Alps, STMicroelectronics (프랑스)  
 PMIC: Texas Instrument (미국)  
 배터리: 아이폰7, 부품 공급업체 리스트  
 배터리 관리: Texas Instrument (미국)  
 NFC칩: NXP (네덜란드)  
 지문 인증 센서: Authentic (미국)  
 터치ID센서: TSMC, XinTech (대만)  
 자료: 언론, 대신증권 리서치센터



RF Power Amp Chips @5G

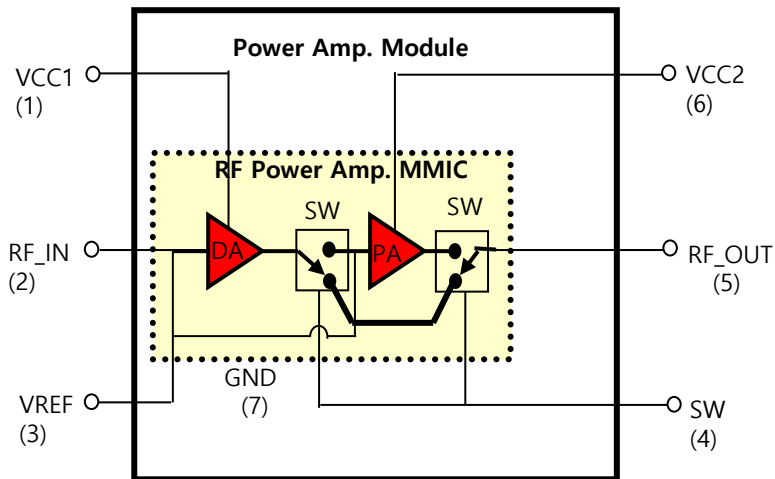
- Experience in developing and commercializing various RF MMICs for wireless communication
- Product development combined with the experience of developing high-speed optical communication transceiver ICs
- Development of ultra-high-speed optical wireless communication parts corresponding to the era of 5G and IoT

Product in Development Phase 2 – Scheduled to Develop from the second half of 2021 to 2022

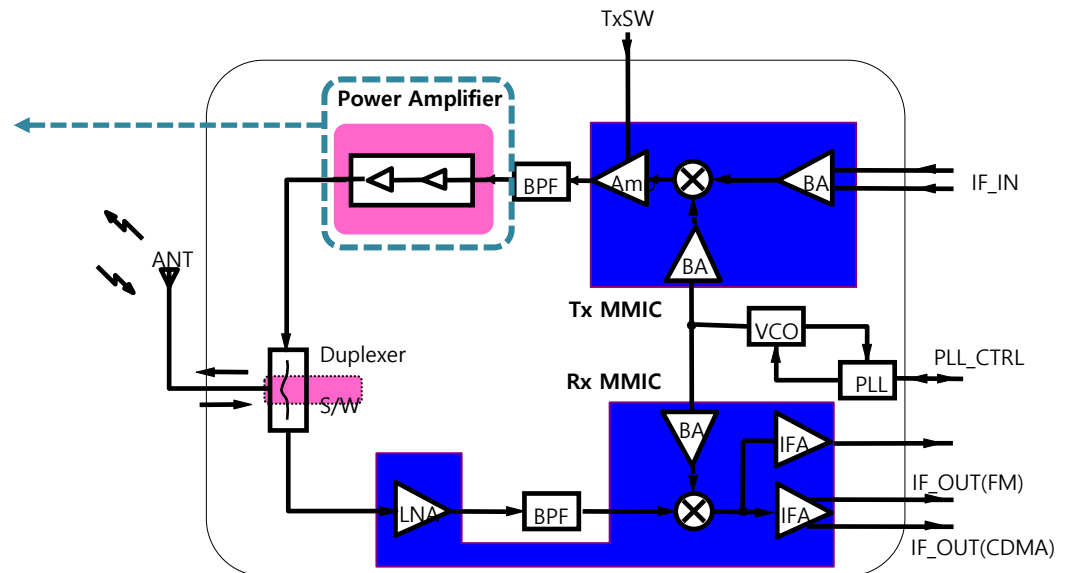
Phase 2

New structure of low-power consumption RF power amplifier MMIC and module

[Conceptual diagram of new structure of low-power consumption RF wireless power amplifier]



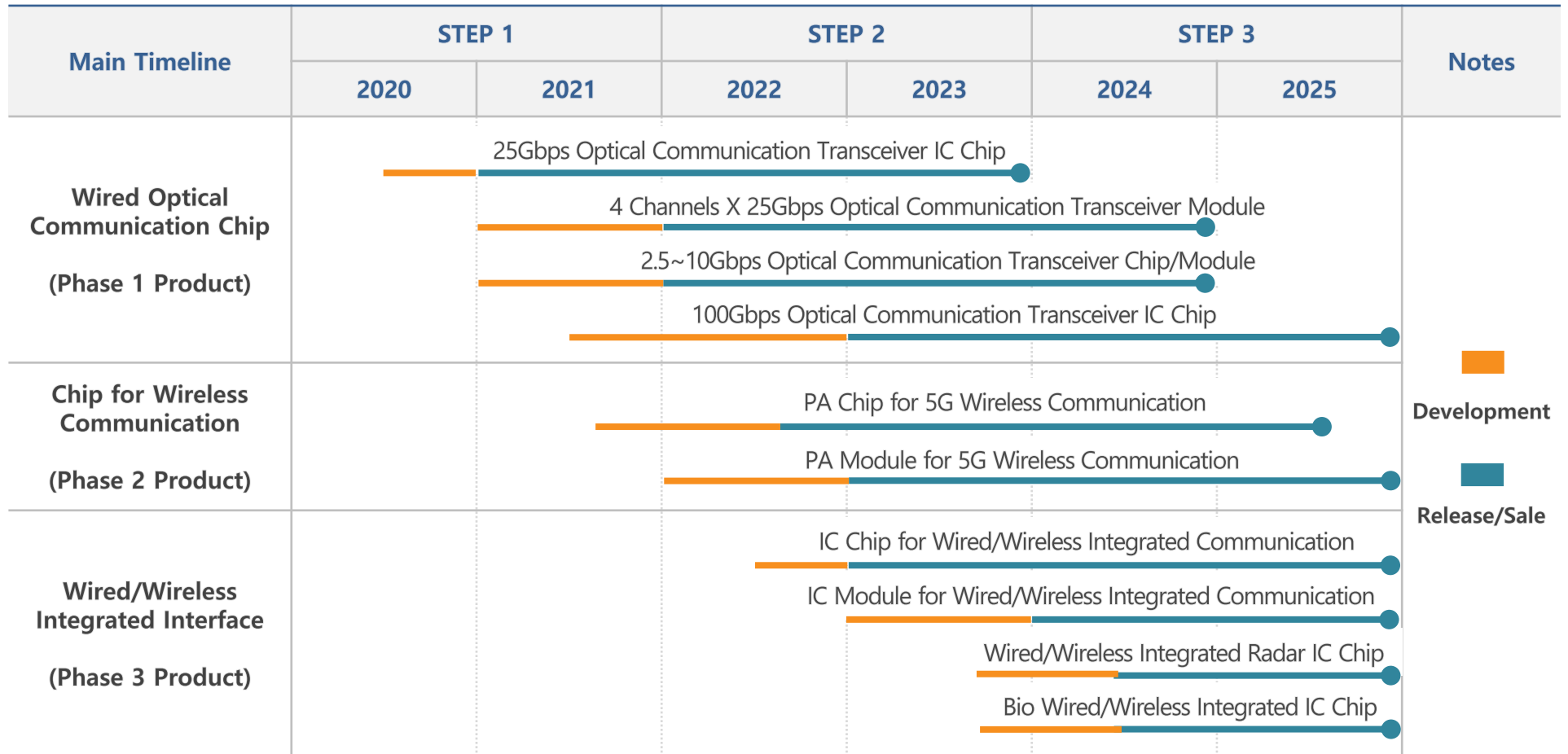
[Conceptual diagram of RF part of smartphone]



- **3 times improved power efficiency**
- **3 times improved battery consumption efficiency**

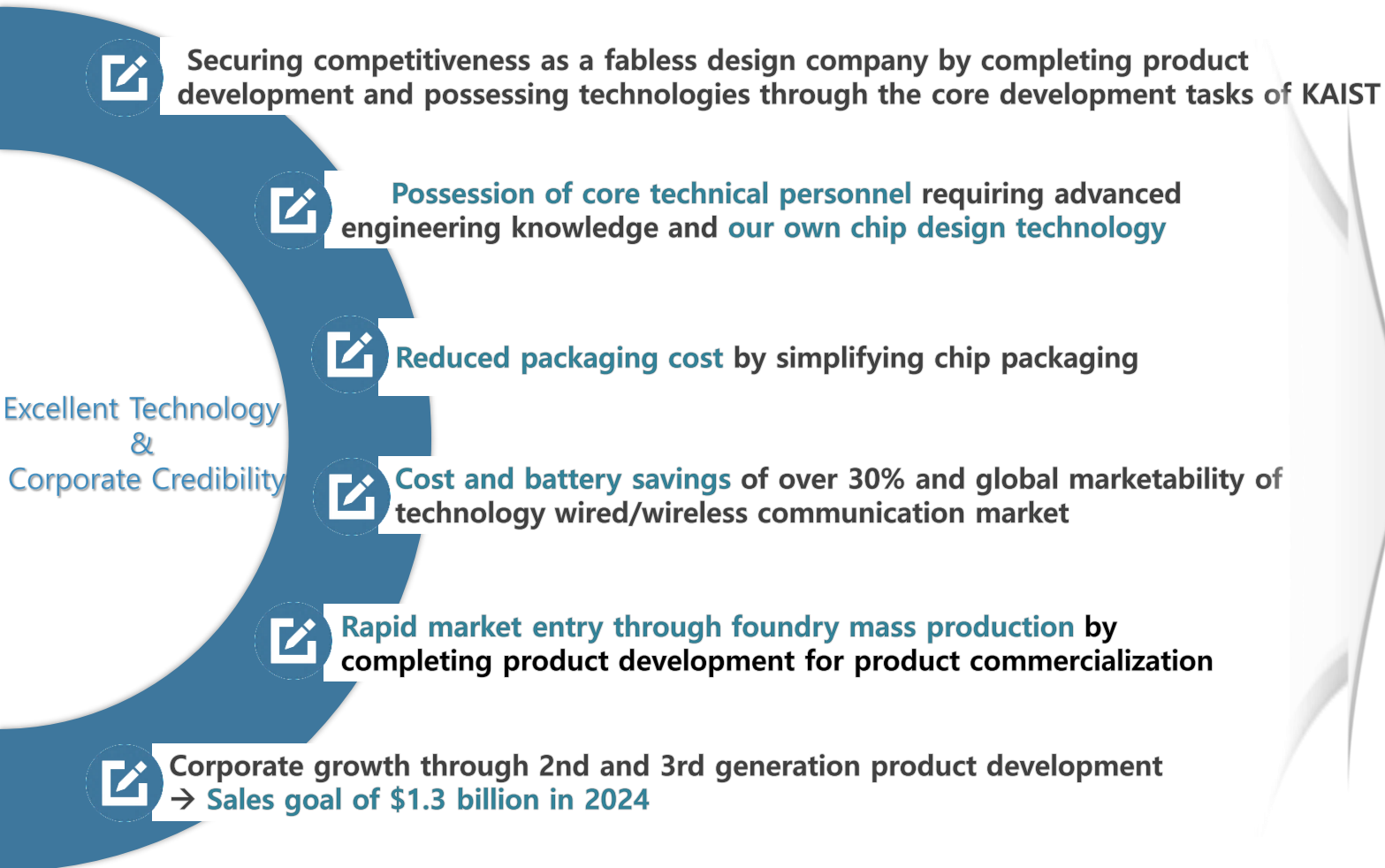
# Development Schedule

## Product Development Plan for Each Phase



# Business Competitiveness

## Having Business Competitiveness



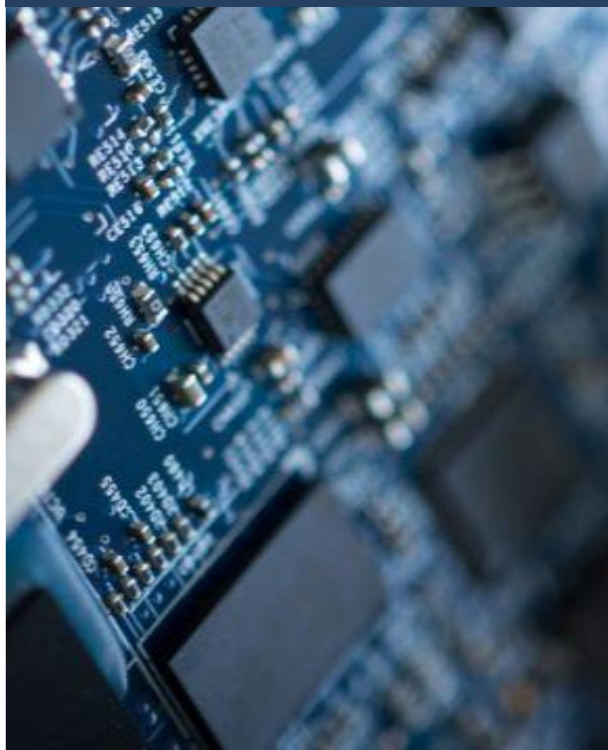
Aim for IPO  
in 2025



# 03

## Market environment

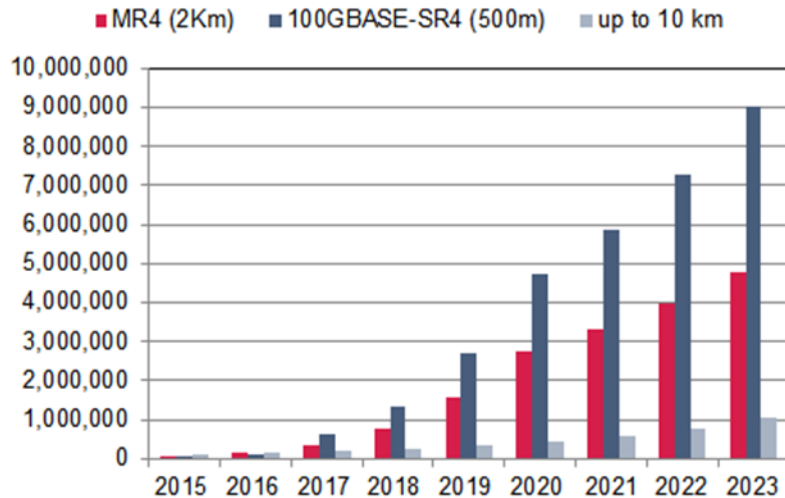
- **Current Status of Market**
- **Comparative Analysis of Competitors**
- **SWOT Analysis**



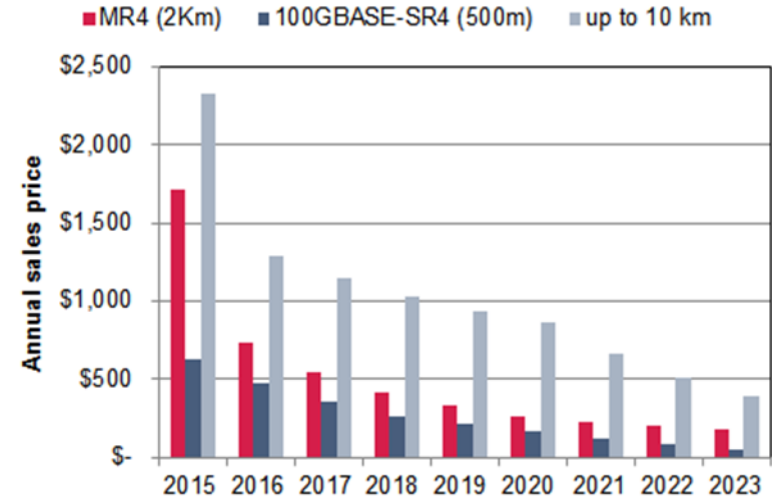
# Current Status of Market

## Market Trends of 100G Optical Module for Data Center

Sales estimates for 100G optical modules based on Dacom & Ethernet



Estimated price fluctuation of 100G optical module



※ Source : "Total Optical Components Forecast Spreadsheet 2014-20", 2015, OVUM

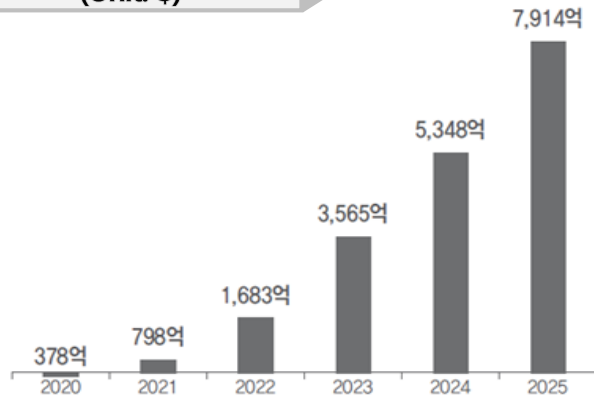
- The market for 100G optical module is expanding and the unit price of the product is decreasing.



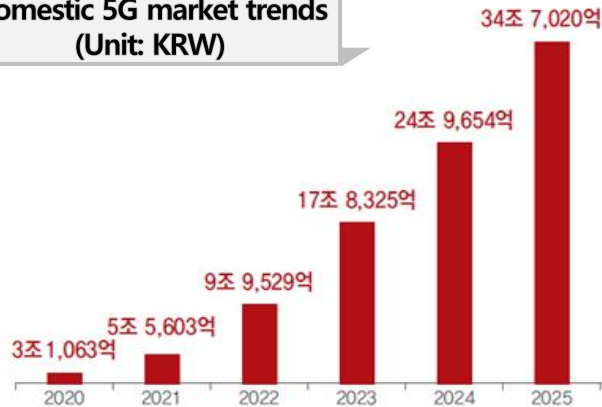
# Current Status of Market

## Market Trends of 5G Mobile Communication Service

Global 5G Market Trend  
(Unit: \$)



Domestic 5G market trends  
(Unit: KRW)



※ Source : ETRI & KT



Development of optical wireless repeater IC, suitable for the era of 5G mobile communication and IoT

Forecast continued growth of market size by 2025

Development of optical wireless repeater based on development experience of MMIC for wireless communication and IC for optical communication  
**Early development, early market entry required**

# Current Status of Market

## Current Status of Semiconductor Market

- The global semiconductor market is dominated by the United States, with more than 50% of the market, and since 2013, Korea has maintained the second largest share of the global semiconductor market (23.6% in 2018).
- In the case of the Korean semiconductor market, it is limited to the area of memory semiconductors led by large companies, and the technology and market competitiveness of system semiconductors, which account for 70% of the global semiconductor market, is insufficient.
- While South Korea's Samsung Electronics and SK Hynix occupied 62% of the global memory semiconductor market and continued their competitive advantage. However, in the global system semiconductor market, global conglomerates such as Intel and Qualcomm occupy about 70% of the market, and Korean companies' system semiconductor market share is only 3.0%.

[Sales Trends of Global semiconductor market]



[Sales growth by booming phase]

Period	Duration (Quarter, A)	Growth (%B)	Growth by Quarter (B/A)
02.3Q-06.4Q	18	96.0	5.3
02.3Q-06.4Q	7	75.8	10.8
02.3Q-06.4Q	11	27.7	2.5
02.3Q-06.4Q	6	44.0	7.3

# Current Status of Market

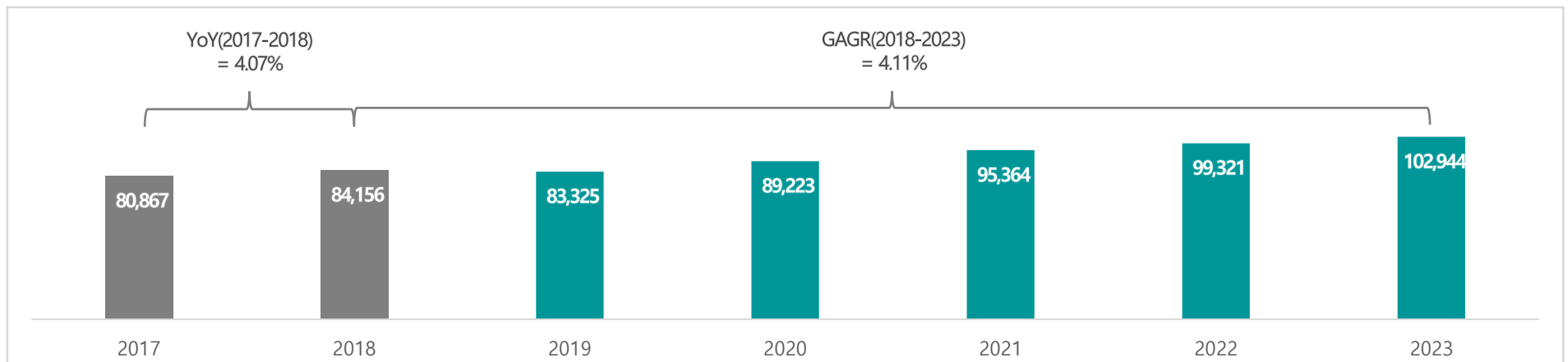
## Market Size of Domestic System Semiconductor

- According to Gartner, the domestic system semiconductor market is expected to reach 8,461 trillion won in 2018, and then grow at an annual average rate of 4.11%, forming a market size of 10,294.9 billion won in 2023.

[ Market size of Korean System Semiconductor]

(Unit: 1 hundred million won)

	2017	2018	2019 (E)	2020 (E)	2021 (E)	2022 (E)	2023 (E)	GAGR (2018~2023)
Market Size	80,867	84,156	83,325	89,233	95,364	99,321	102,944	4.11%
Growth Rate (YoY)	-	4.1%	-1.0%	7.1%	6.9%	4.1%	3.6%	



※ Source : Gartner, Korea Credit Information Services(TDB)

# Current Status of Market

## Semiconductor Market Size and Prospect

(Unit: USD 1 million, %)

		2020	2021	2022	2023	2020~2023 Total
Semiconductor	Market Size	448,514	490,375	515,162	517,863	1,971,914
	Growth Rate	5.5	9.3	5.1	0.5	
Memory Semiconductor	Market Size	125,878	151,937	162,444	150,589	590,848
	Growth Rate	9.0	20.7	6.9	-7.3	
System Semiconductor	Market Size	244,565	255,402	265,934	277,724	1,043,625
	Growth Rate	2.4	4.4	4.1	4.4	
Optical Discrete Device	Market Size	76,957	80,576	84,736	88,461	330,730
	Growth Rate	4.3	4.7	5.2	4.4	

※ Source : HIS Market 2019, Nice D&B Reformation

# Current Status of Market

## Semiconductor Market Size and Prospect

### Why should Korea focus on the system semiconductor field?

Korea has global conglomerates such as Hyundai Motor, Samsung Electronics and LG Electronics in the automotive and electronics sectors.

In short, there are demands from prominent companies in Korea that will use system semiconductors.

Domestic and foreign markets for 5G, artificial intelligence (AI), Internet of Things (IoT), autonomous vehicles, and robots are expected to increase.

[Forecast of memory and system semiconductor market size]

(단위: 십억달러)



※ Source : KTB Investment & Securities

[SWOT Analysis of System Semiconductor]



# Current Status of Market

## Value Chain of Semiconductor Industry

Process	비즈니스 모델	사업 특성	주요 기업
Batch Process	IDM (Integrated Device Manufacturer)	<ul style="list-style-type: none"> <li>• Build a batch process system from chip design to manufacturing and testing</li> <li>• The most mature model of memory manufacturing</li> <li>• Secure competition through technology and economies of scale</li> <li>• High risk, high return form of large-scale investment</li> </ul>	<ul style="list-style-type: none"> <li>• INTEL(USA)</li> <li>• TOSHIBA(Japan)</li> <li>• 삼성전자(Korea)</li> <li>• SK하이닉스(Korea)</li> </ul>
Front-end Process	Fabless (Design)	<ul style="list-style-type: none"> <li>• Specializes in chip design only</li> <li>• Most of the fixed costs are R&amp;D and labor costs</li> <li>• Avoid high-risk large-scale investments, and require commissioned manufacturing costs</li> </ul>	<ul style="list-style-type: none"> <li>• BROADCOM(USA)</li> <li>• QUALCOMM(USA)</li> <li>• MEDIATEK(Taiwan)</li> <li>• 실리콘웍스(Korea)</li> </ul>
	Foundry (Consignment Manufacturing)	<ul style="list-style-type: none"> <li>• Only for chip production by order method, it is manufactured by being commissioned by fabless</li> </ul>	<ul style="list-style-type: none"> <li>• TSMC(Taiwan)</li> <li>• GLOBAL FOUNDRIES(USA)</li> <li>• DB하이텍(Korea)</li> </ul>
Back-end Process	SATS (Packaging&Test)	<ul style="list-style-type: none"> <li>• Assemble and test the finished wafer</li> <li>• Needs More Capital After IDM, Foundry</li> </ul>	<ul style="list-style-type: none"> <li>• AMKOR(USA)</li> <li>• ASE(Taiwan)</li> <li>• 네팩스(Korea)</li> <li>• 하나마이크론(Korea)</li> <li>• STS반도체(Korea)</li> </ul>
IP Design	IP Professional (Chipless)	<ul style="list-style-type: none"> <li>• Specialized in design technology R&amp;D</li> <li>• Provide IP to IDM or Fabless</li> </ul>	<ul style="list-style-type: none"> <li>• ARM(USA)</li> <li>• RAMBUS(USA)</li> <li>• 칩스앤미디어(Korea)</li> </ul>

※ Source : KDB(Korea Development Bank), Nice D&B Reformation

# Comparative Analysis of Competitors

## Wired optical communication

Integrated 25G IC chip for bidirectional transmission and reception for 100G data centers

Item	CnF KOREA	Competitor	Notes
Characteristics	<b>Bidirectional integrated chip</b>	Separated transmit and receive chips	2 in 1 (One chip)
Chip Area	<b>70%</b>	100%	Cost Reduction
Power Consumption	<b>70%</b>	100%	
Battery Usage Time	<b>130%</b>	100%	Long-term use
Chip Quantity	<b>1</b>	2	One chip, Reduced package cost
Package Cost	<b>70%</b>	100%	Cost Reduction

# Comparative Analysis of Competitors

## Wireless Communication

Power amplifier IC chip for smart wireless communication

Item	CnF KOREA	Competitor	Notes
Characteristics	Integrated chip (1 chip), protection circuit adopted	Single chip (3 chips), protection circuit adopted	3 in 1 (one chip)
Power Consumption	70%	100%	
Battery Usage Time	130%	100%	Long-term use
Chip Package Cost	70%	100%	Reduced package cost
Overheating	Low	Very high	Reduced power consumption



## SWOT Analysis

### Strength

- Wired/wireless IC chip design technology capability
- Human resource competency such as ETRI, KAIST
- Product performance and cost reduction advantage
- Establishment of step-by-step development roadmap
- High technical barriers to entry

### Opportunity

- Expansion of 5G market
- Expansion of the wired/wireless integrated module market
- Government's system semiconductor industry promotion plan



### Weakness

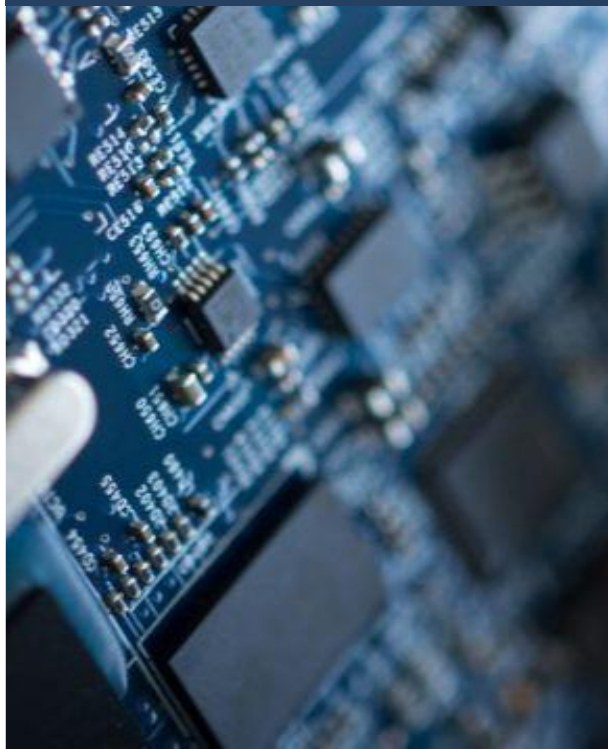
- Commercialization funds
  - Global sales network competency
- Production-based overseas outsourcing

### Threat

- R&D capabilities of large companies
- Huge investment capital of overseas IT companies
  - No production line of domestic large company



# 04

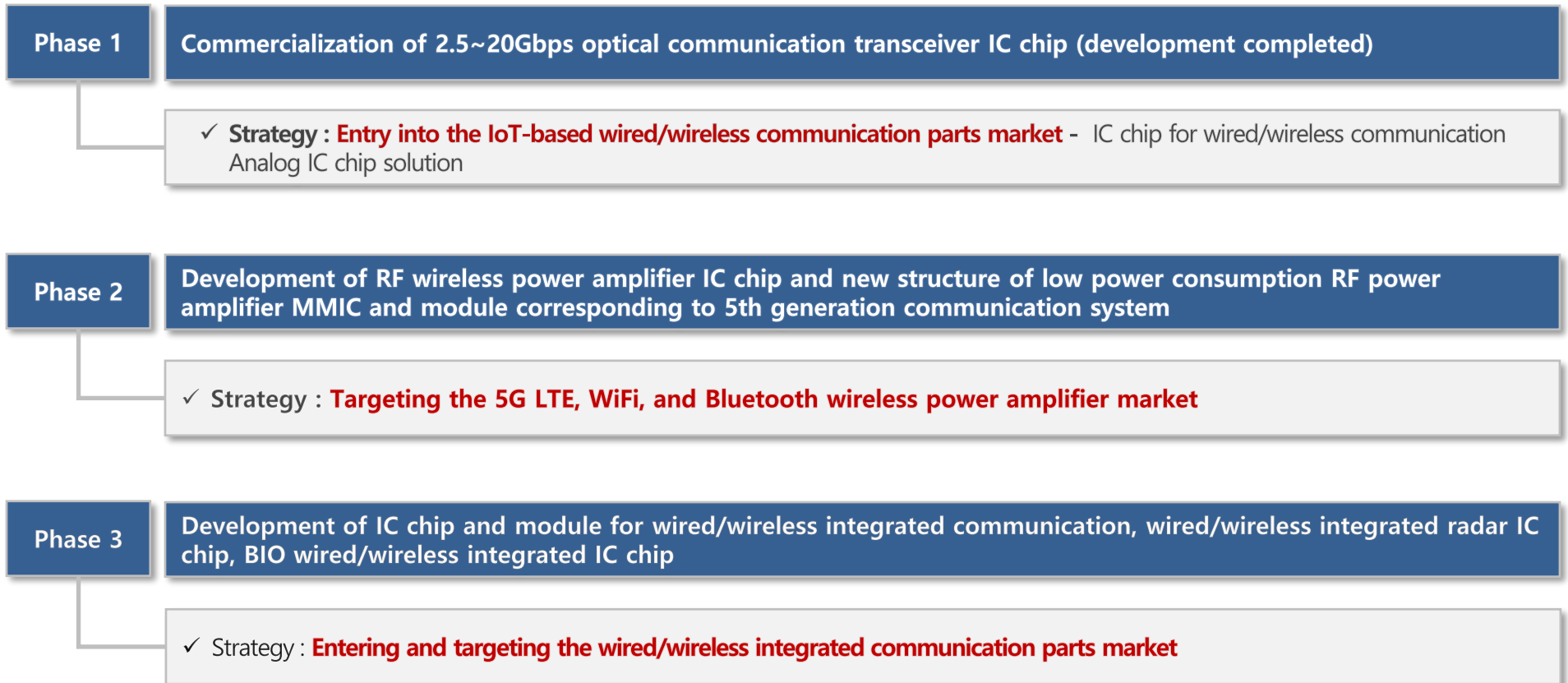


## Business Strategy

- **Technology Development Strategy**
- **Business Growth Strategy**
- **Operation Plan**
  - Production Plan
  - Business Plan
  - Sales Plan
  - Timeline

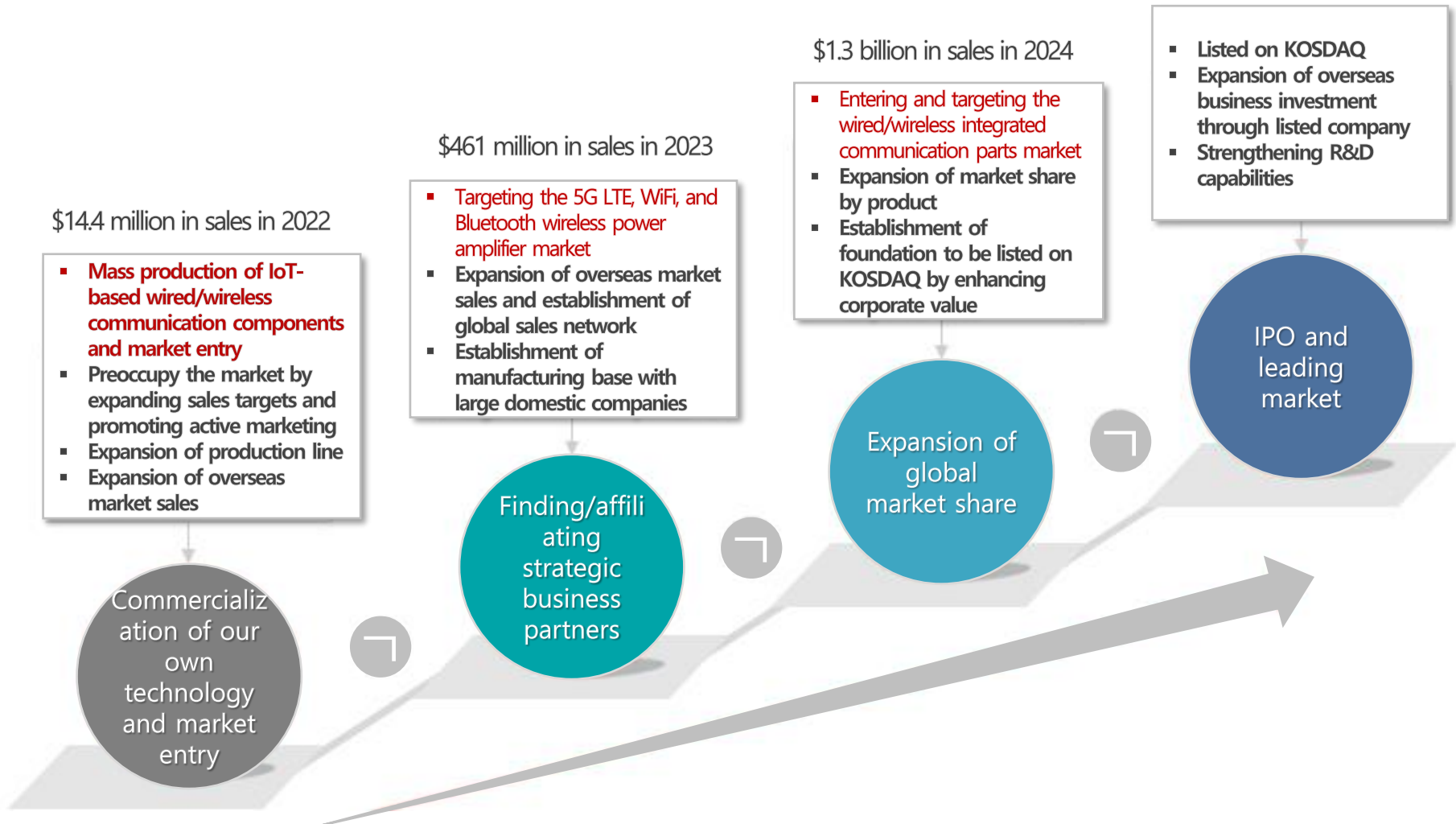
# Technology Development Strategy

## Phase-by-phase Technology Development Strategy



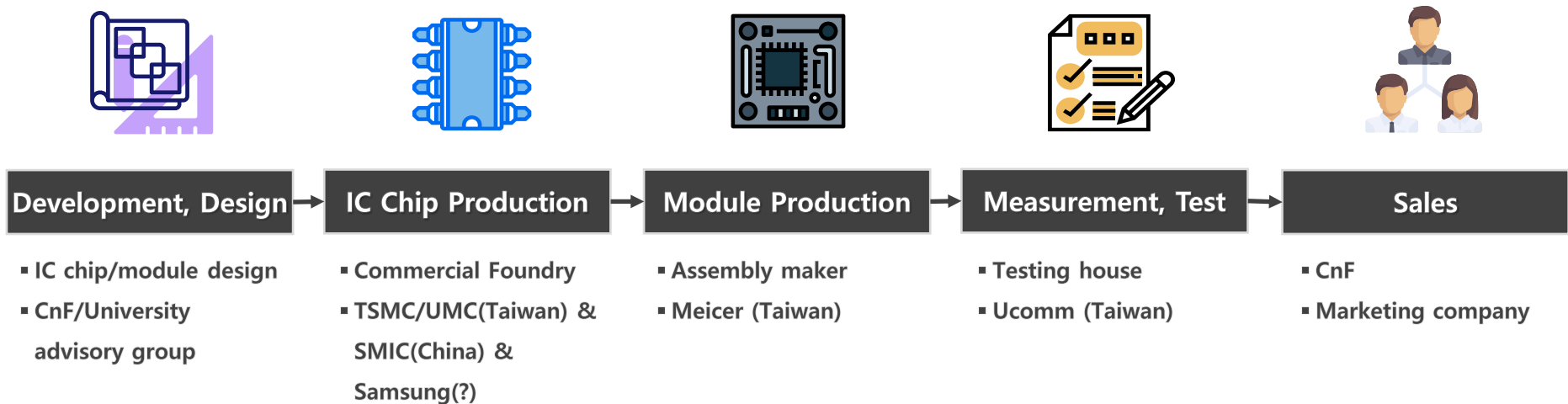
# Business Growth Strategy

Maximizing corporate value through IPO promotion! Leap into a global market leader!



## Flow Chart of Mass Production

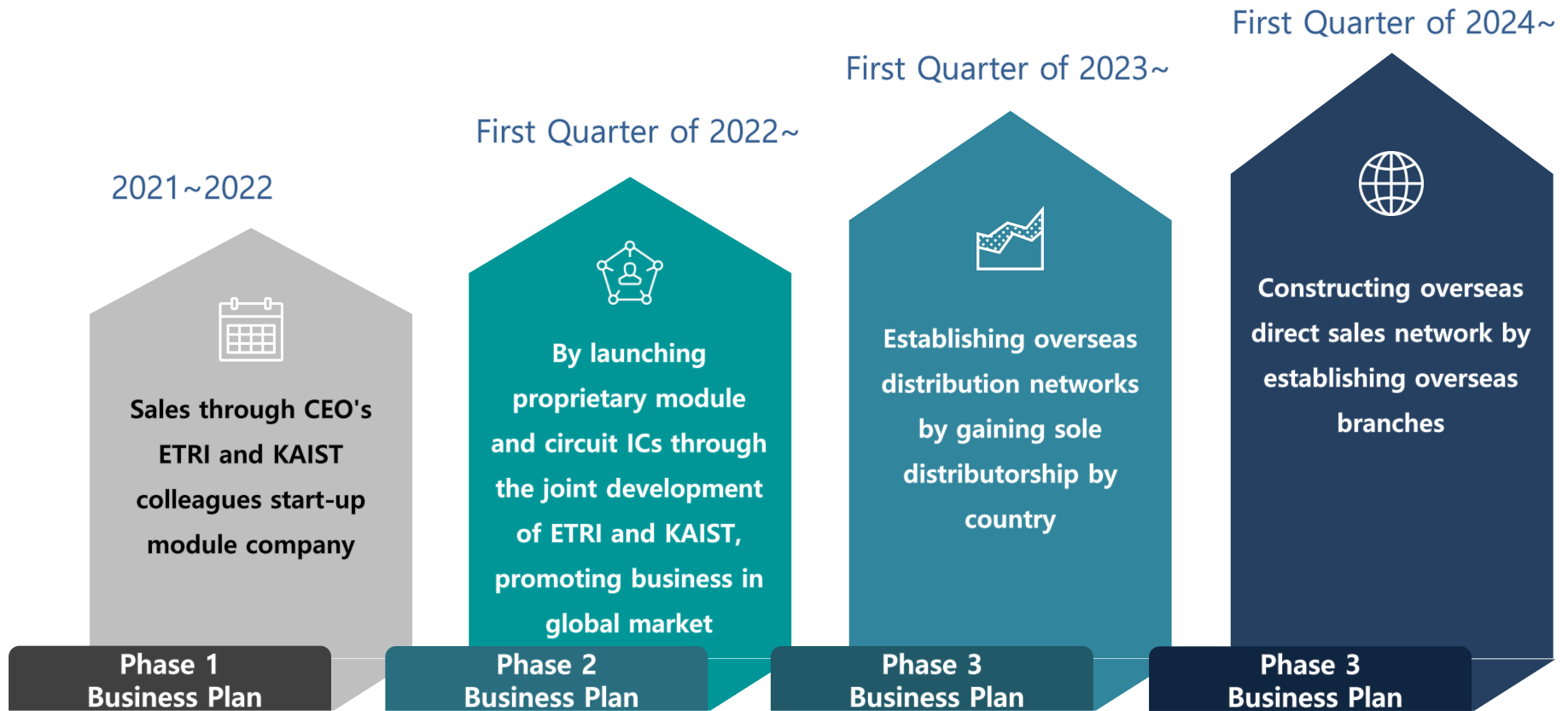
### Production Flow Chart of Fabless IC Design Company



Starting with the design of IC chips/modules and planning to expand to the module/system design/production area  
Establishing mass production system by utilizing commercial foundries such as TSMC/UMC/SMIC

## Promotion Plan

### Wired Optical Communication IC Chip (100Gbps, 10G, 5G, 2.5G) Domestic and Overseas Business Plan



\* ETRI : Electronics and Telecommunications Research Institute, KAIST : Korea Advanced Institute of Science and Technology

**Thank  
you**

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**Chips & Future Co., Ltd**

**TAEWON ENTERPRISE**