



ACE Royal Tech Inc.
(주)에이스 로얄테크

TYNTEK Corporation

鼎元光電科技股份有限公司



ACE Royal Tech Inc.

T. 031-905-0968 F. 02-6230-9289

<http://www.aceroyal.co.kr>

e-mail; marketing@aceroyal.co.kr

Sales Division: William Ma



鼎元光電科技股份有限公司
TYNTEK CORPORATION

Company Overview

Foundation

in **1987**

IPO at TWSE

in **2000**

Quality System Certificated

ISO 9001 ISO14001
QS 9000 IATF16949

Production Capacity

4000

Million chips per month

Employees

900

Location

4

Fab

Fab & Office Locations

- Kejung Plant (Taiwan)
 - Executive office
 - 6 inch Silicon Devices Wafer Fab
- Renai Plant (Taiwan)
 - Compound Semiconductor and 5 inch Silicon Devices Wafer Fab
- Hsinchu Plant (Taiwan)
 - Optical Fiber Communication Devices Wafer Fab
- Wuhan Plant (China)
 - LED and 5 inch Silicon Devices Fab



Our Customers

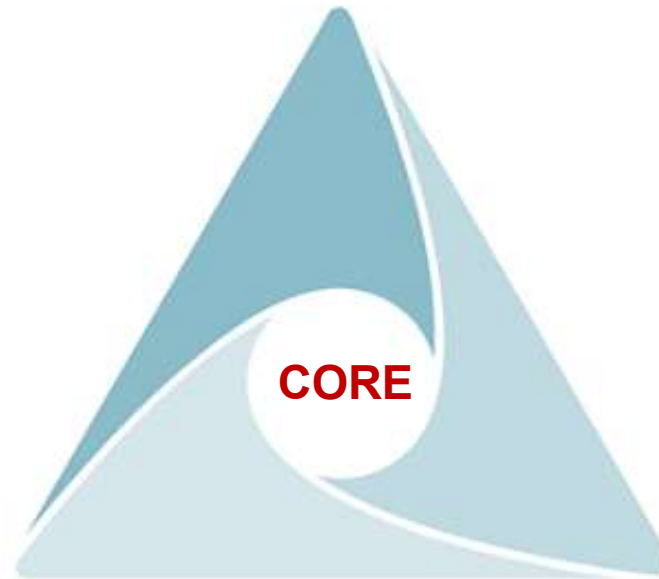
- Taiwan & Mainland China : 60%
- North America: 15%
- Europe : 10%
- Pan Asia : 15%



Main Product Lines



Compound Semiconductor



Silicon Device

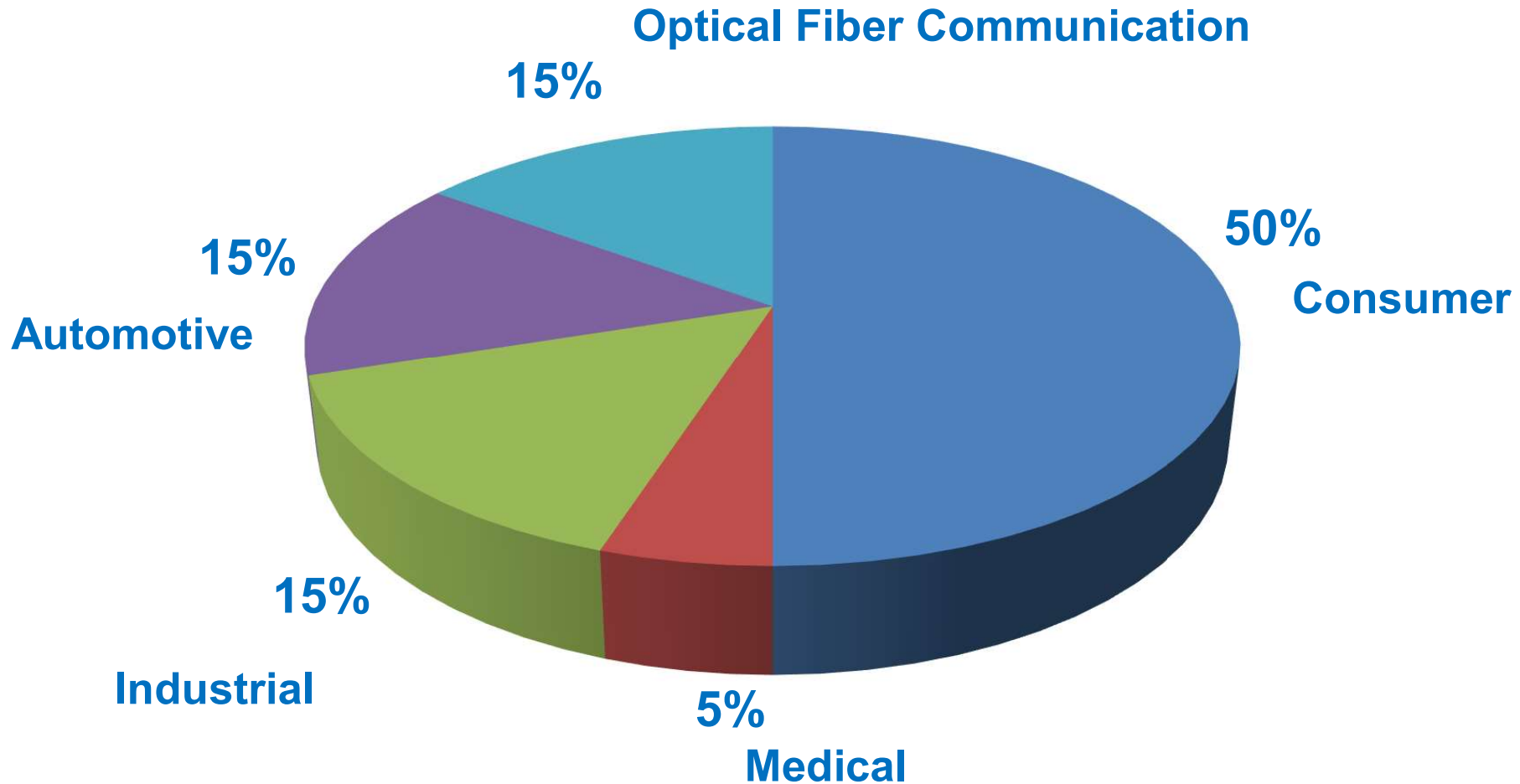
**Optical Fiber
Communication Device**

Key Products

- **Visible LED Chips**
- **Infrared LED Chips**
- **Optical Fiber Communication**
- **Silicon Photo Diode**
- **Silicon Photo Transistor**
- **Silicon Zener Diode**
- **Silicon Power Products**

Revenue Allocation by Application

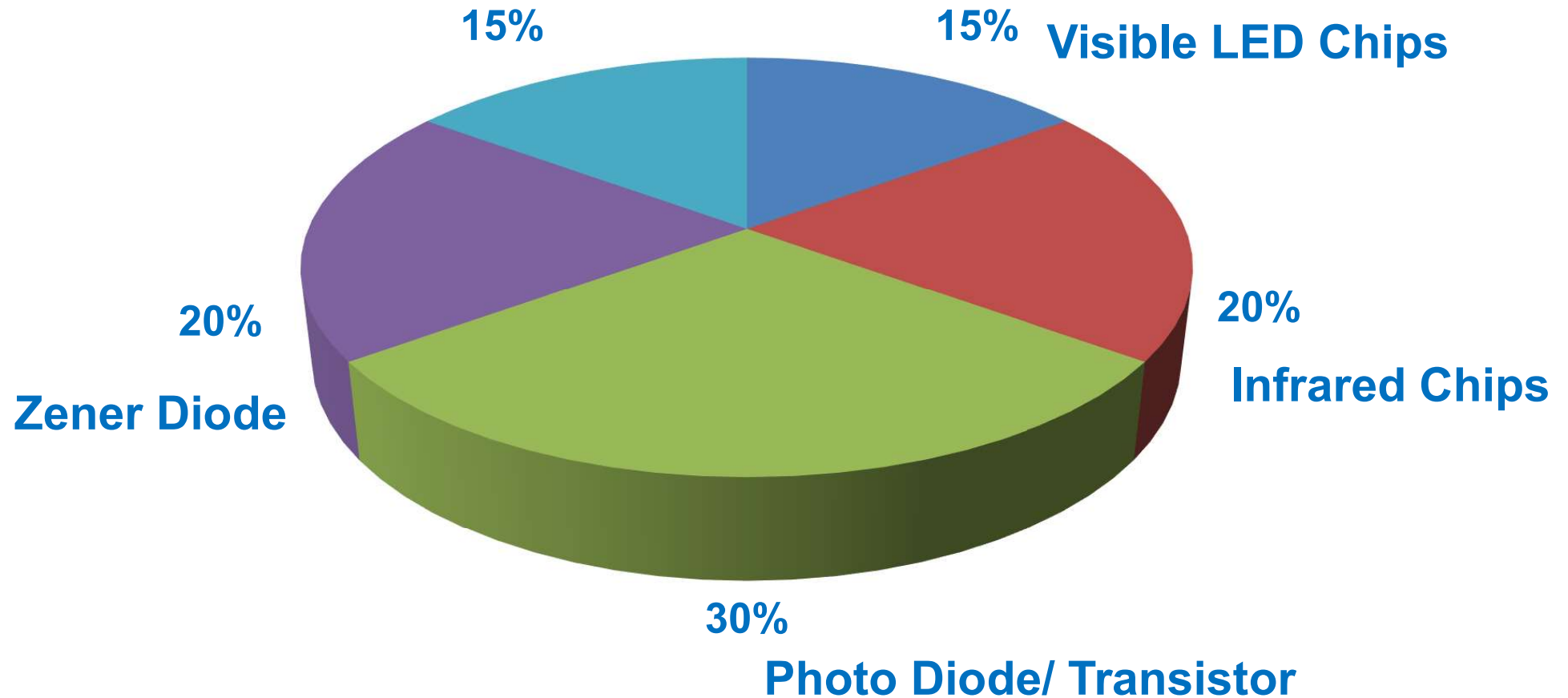
Calculated until Q1-2019



Revenue Allocation by Major Products

Calculated until Q1-2019

Optical Fiber Communication Device



LED Device

Visible LED Chips

High Brightness

AlGaInP(WB)

General Brightness

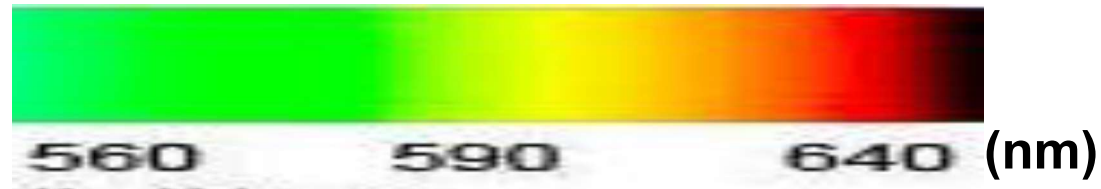
AlGaInP

Low Brightness

GaP

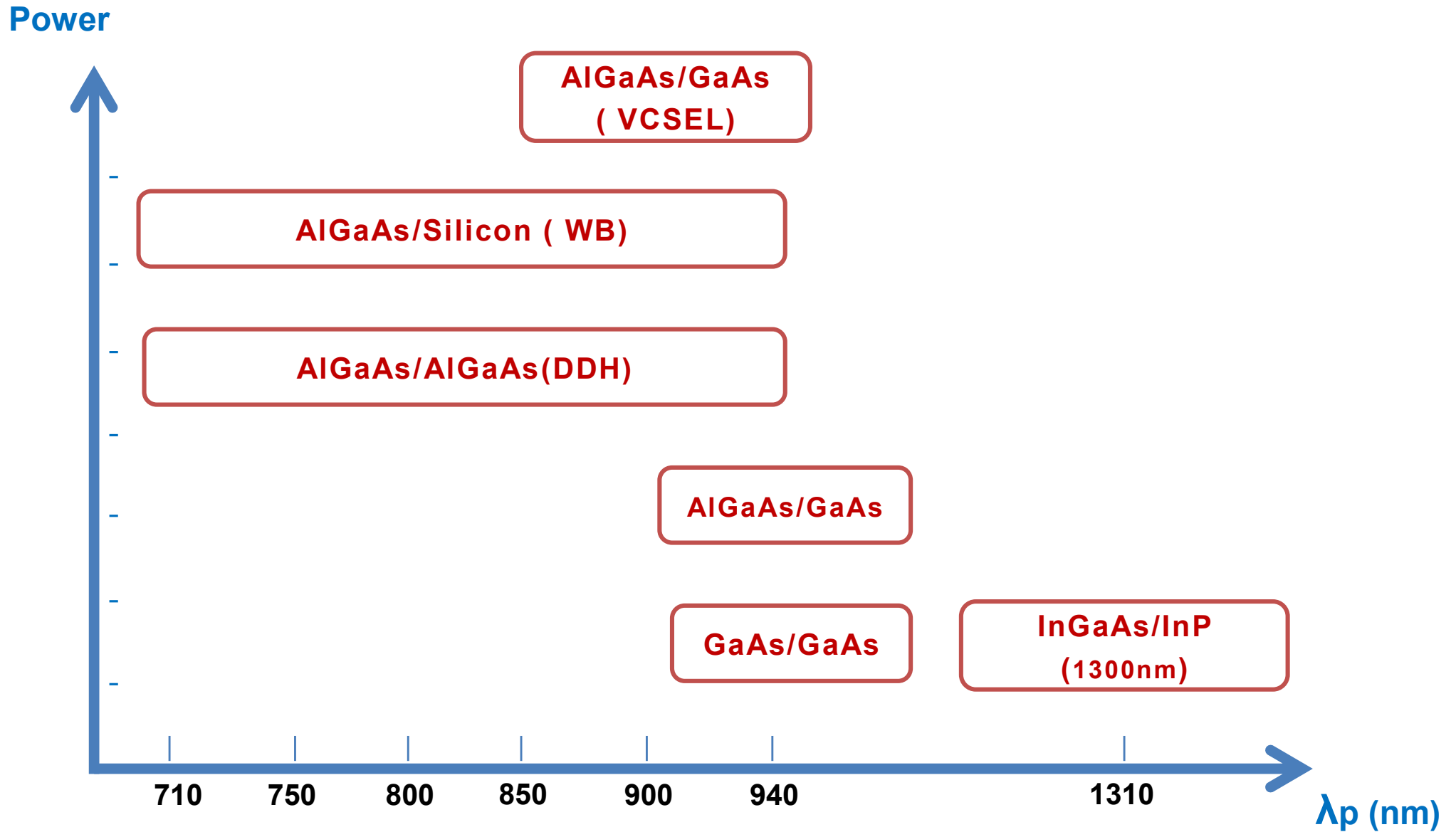
GaAsP

AlGaAs



LED Device

■ Infrared LED Chips



Optical Fiber Communication Device

- **InGaAs MPD(Monitor Photo Diode)**
 - Aperture from 200 μ m to 3000 μ m
 - Spectral response from 1260nm to 1600nm
 - Responsivity > 0.85A/W @ 0.2mW
- **InGaAs PIN Photo Diode**
 - Bandwidth 1.25/2.5/10/25/100 GHz
- **InGaAs APD**
 - Bandwidth 2.5 GHz
 - Bandwidth 10 GHz
- **GaAs PIN Photo Diode**
 - Bandwidth 5/10/25/40/100 GHz
 - Spectral response from 800nm to 900nm

Optical Fiber Communication Device

■ Main Application

Data Center

Wavelength : 850 nm

GaAs PD

- Single/Array Diode

VCSEL

- Single /Array chip

Wavelength : 1260~1600nm

InGaAs PD

- 25G/100G PD
- Edge Monitor PD

PONs

Wavelength:1260~1600nm

InGaAs PIN PD

- Coplanar type
- Monitor PD
(Aperture 200~500um)

InGaAs APD

- Bandwidth 2.5GHz
- Bandwidth 10GHz

Customized

Wavelength:850~1600nm

InGaAs PIN PD

- Large active area PD
(Aperture 1,000um~3,000um)
- Proximity Sensor

Silicon Device

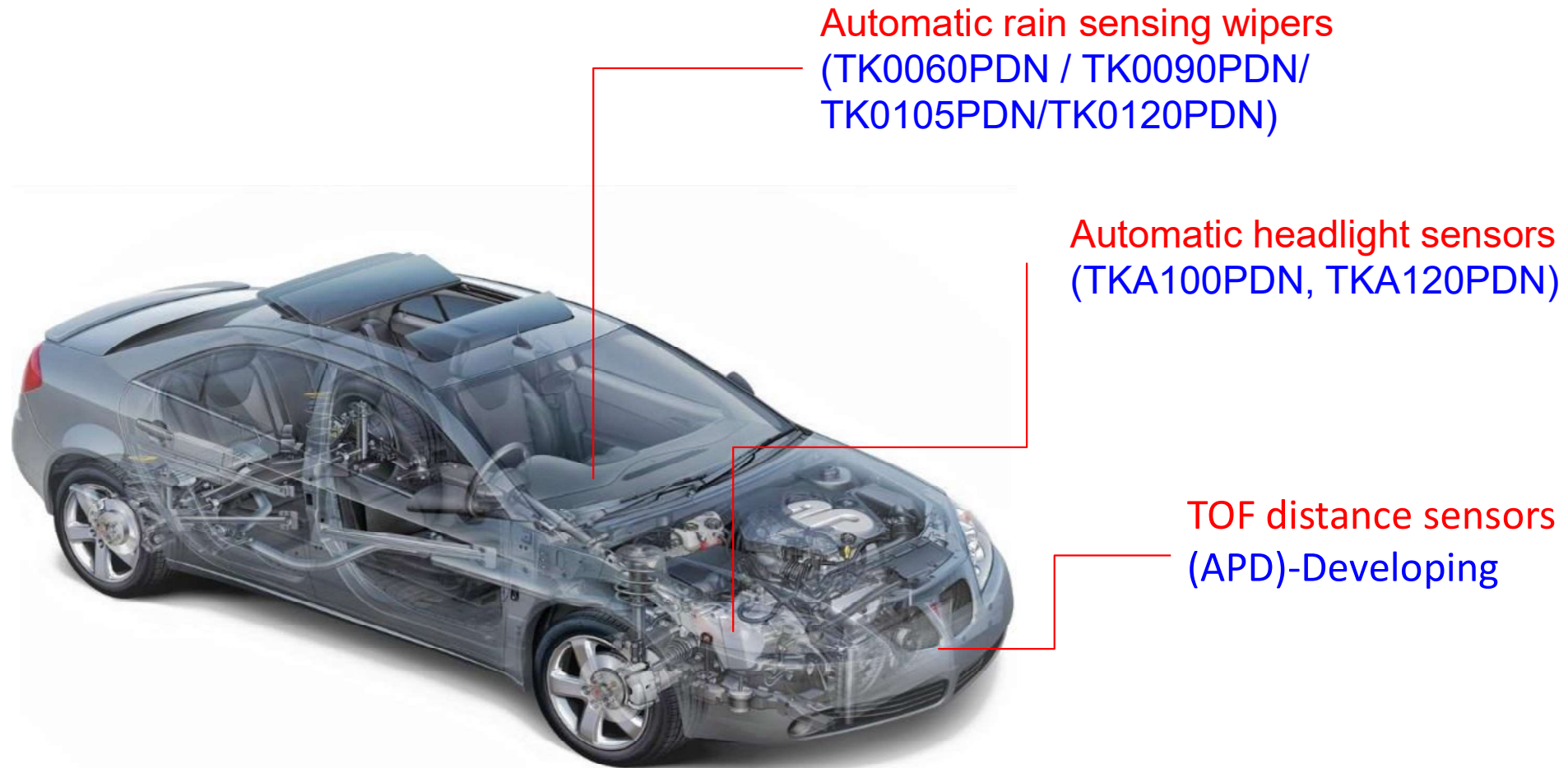
■Photo Diode/Transistor Group

Photo Diode structure	Specification
P-I-N (Vertical and Lateral type)	Standard:14mil ~120mil. Customize is available.
N-I-P (Vertical and Lateral type)	Standard:14mil ~80mil. Customize is available.
Customized Design	Encoder, Enhance PD, Low Pass/High Pass/Band Pass Coating

Photo Transistor structure	Specification
N-P-N (Vertical type)	Standard:16mil ~24mil. HFE 200~3,000 Customize is available.
Customized Design	Low Pass/High Pass/Band Pass Coating

Silicon Device

■ Photo Diode / Optical Automotive Sensor Application

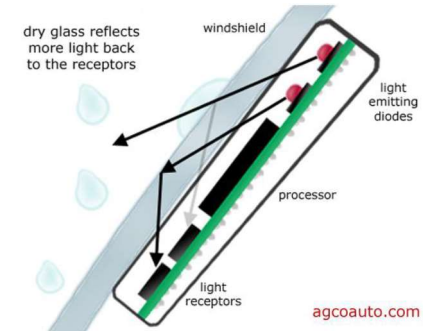


Silicon Device

Photo Diode / Optical Automotive Sensor Application

Automatic rain sensing wiper:

Application



Products	Picture	Chips Size (X* Y)	Chips Area (mil ²)	Thickness (um)	Vf(v) @10mA	VBR(V) @100uA	ID(nA) @10v	IL(uA) @940nm/ 1mW	Ct(pF) @3v
					Max.	Typ.	Max.	Typ.	Typ.
TK0060PDN		60x60mil	3600	300	1.3	150	10	57	11
TK0090PDN		90x90mil	8100	300	1.3	150	20	110	16
TK0105PDN		105x105mil	11025	300	1.1	150	10	155	18
TK0120PDN		120x120mil	14400	300	1.3	150	10	180	22



Silicon Device

Photo Diode / Optical Automotive Sensor Application

Automatic headlight sensors:

Application



Products	Picture	Chips Size (X* Y)	Chips Area (mil ²)	Thickness (um)	Vf(v) @10mA	VBR(V) @100uA	ID(nA) @10v	IL(uA) @550nm/ 1mW	IL(uA) @940nm/ 1mW	Ct(pF) @3v
					Max.	Typ.	Max.	Typ.	Typ.	Typ.
TKA100PDN		100x100mil	10000	300	1.3	150	10	24	3	15
TKA120PDN		120x120mil	14400	300	1.3	150	10	38	5	22

Silicon Device

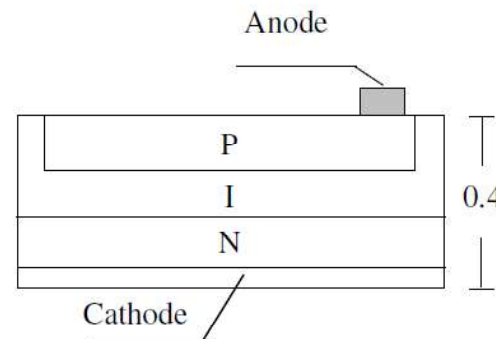
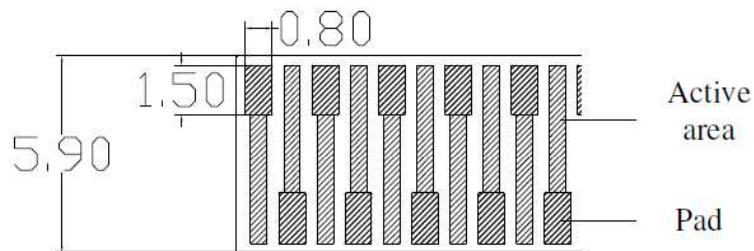
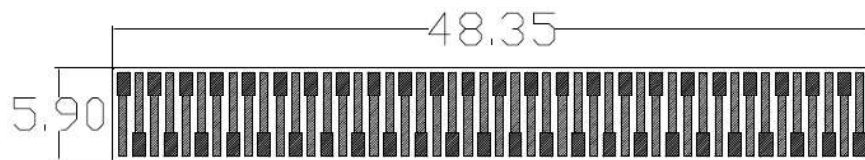
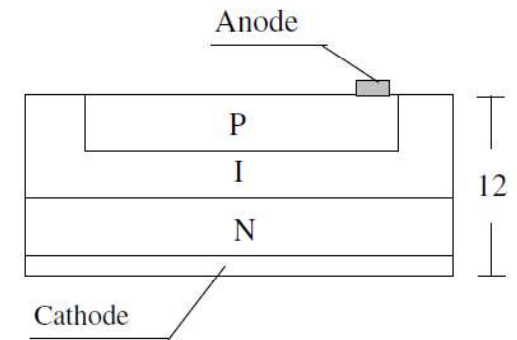
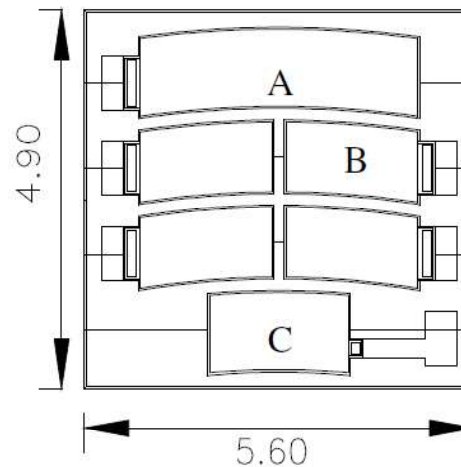
Photo Diode / Photo Transistor Application

Products	Application
TK0014PDN	ToF (Time of flight) face sensor on Mobile phone.
TKBM14PDN	
TK0060PDN, TK0090PDN, TK0105PDN..etc.	Normal IR sensor
TK0060UPD, TK0090UPD, TK0120UPD	UV enhance sensor
TK0N60PDN..etc.	IR sensor on electronic whiteboard , Receive Module
TKG060PDN, TKR060PDN, TKB060PDN, TKA100PDN,TKA120PDN..etc.	Low pass/High pass/Band pass Sensor
TK120UPDB	Wearable pulse sensor
TK0032HPD	1.25Ghz on PoF (Plastic optical fiber)
TK0AC6PDN, TKAC15PDN,TKAC48PDN	Encoder , muti-cell PD
TKCS16PTS, TKCS18PTN, TK0124PTN..etc.	Photo-coupler , interrupter

Silicon Device

Customized Photo Diode (Encoder Application)

6 active area cells
TK0AC6PDN

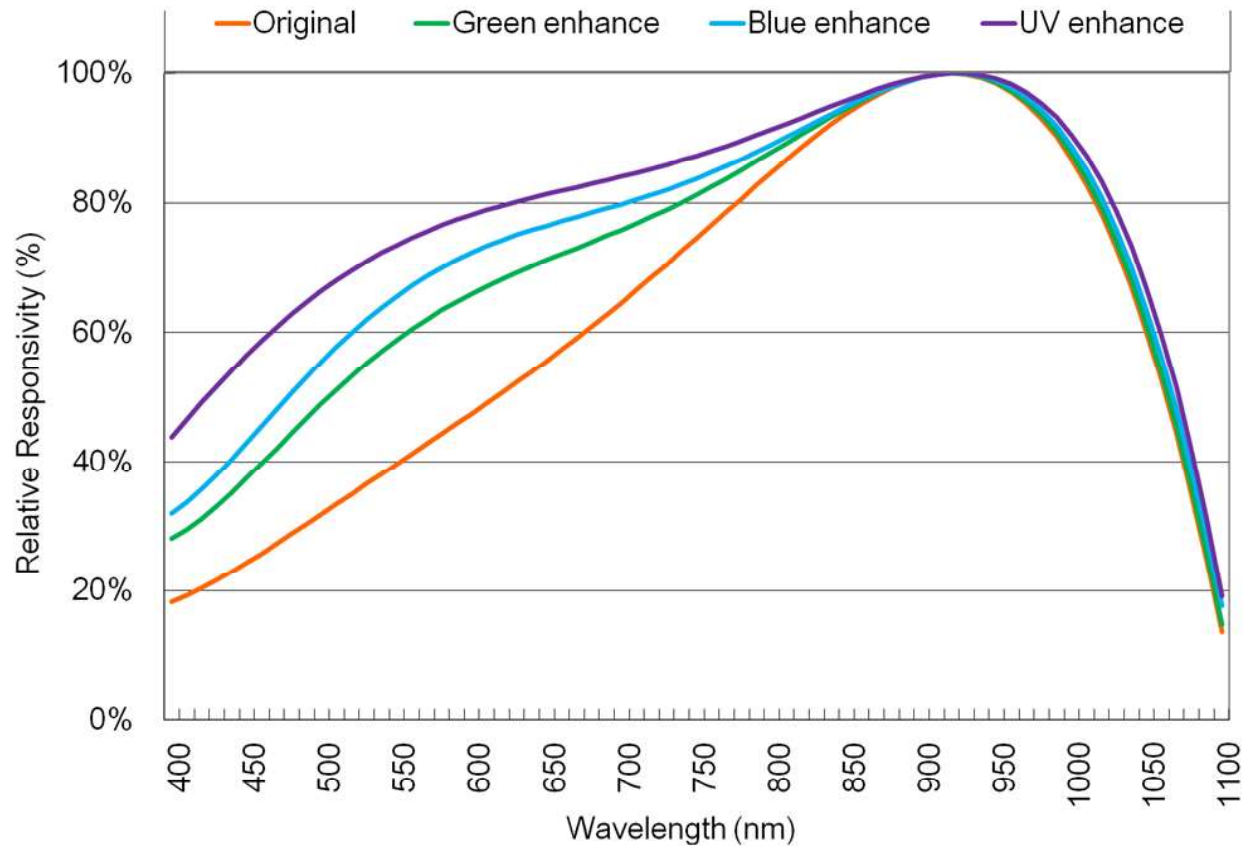


48 cells (active area)
TKAC48PDN



Silicon Device

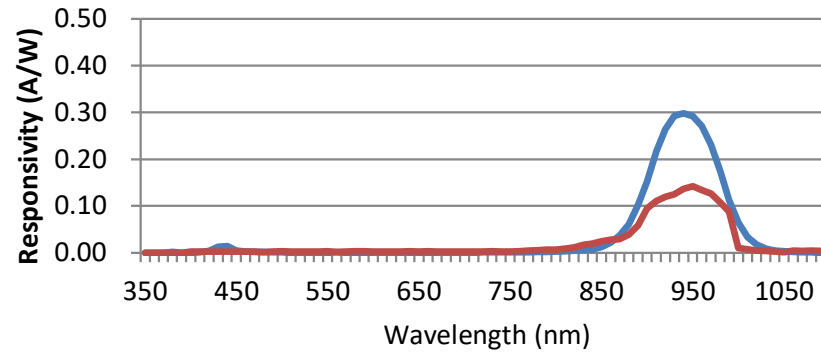
- Customized Photo Diode (UV ~Blue~Green Enhanced)
- To Have More Efficiency of Visible from 400~660nm



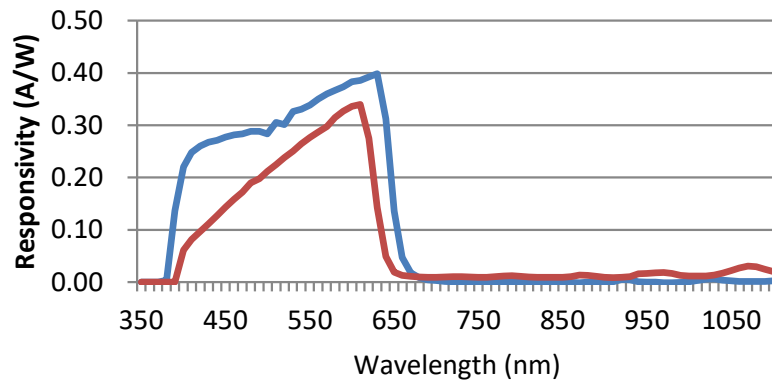
Silicon Device

- Customized and Standard Thin Film Surface Coating (Low/High/Band Pass)

IR940nm - Simulate vs Actual

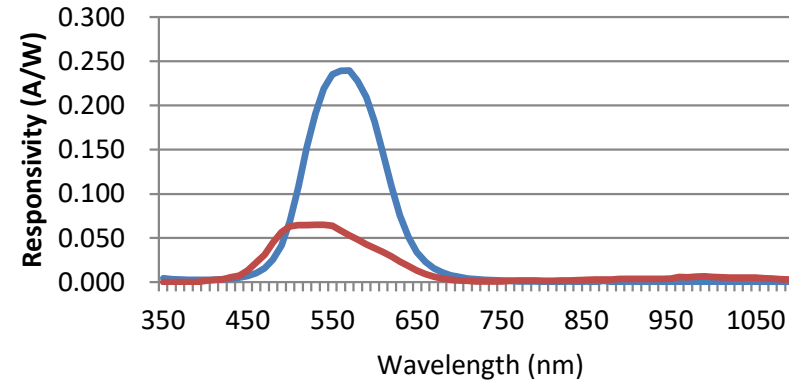


Red 650nm - Simulate vs Actual



— 120PDG-R650 — PD-R650

Green 550nm - Simulate vs Actual



— 120PDG-G550 — PD-G550

Silicon Device

■ Zener Diode

Function: ESD / Surge Protection / Leakage Detection / Voltage Regulation

Zener Diode structure	Specification
P-N (Top Anode Vertical type and Lateral type)	1 direction Zener, Standard:6mil ~18mil. Break down Voltage :5V~130V, Customize is available.
N-P (Top Cathode Vertical type)	1 direction Zener, Standard:6mil ~18mil. Break down Voltage :5V~20V, Customize is available.
NPN (Top Anode Vertical type)	2 direction Zener , Standard:6mil~ 9mil Break down Voltage :5V~20V, Customize is available.
PNP (Flip type)	2 direction Flip Zener, Standard: 18~25mil Break down Voltage :5V~57V, Customize is available.

Silicon Device

▪6 Inch Wafer Power Products

- Set up at Q2 2018, Mass Production in Q1 2019
- Production Capacity: extend to 10,000pcs wafer/M at 2020 , 30,000pcs wafer/M at 2021

Products	Specification	Applications
Power Zener Diode	13mil: 5.1/5.6/6.2V 33mil: 5.6V 49mil: 5.6V	Voltage Regulation(MP in 2019Q3)
TVS Diode	6-9V, Cp typ 0.3pF	ESD protection(MP in 2019 Q3)
Schottky Diode (Low volt. & low Vf)		Low voltage switching (Plan:2020 Q1)
Schottky Diode (High volt. & high temp)		High voltage Switching(Plan:2020 Q3)
FRED (Fast Recovery Epitaxial Diode)		High voltage Switching(Plan:2020 Q3)

Driving Force for Potential Growth

- IoT / Smart Home Appliance

- * IRED / VCSEL
- * Photo Sensor for Medical / Safety / Environment Sensing
- * Home appliance /Distance sensor/ Smart Phone sensor/ .. etc

- IoC / Smart Car

- * IRED / VCSEL for Night Vision / LiDAR
- * Photo Sensor for Automotive Sensing

- 5G Facilitis

- * Compound Fiber-Optical PD / APD for Monitoring / Receiver
- * Data center/ Fiber to home facility/ Base station

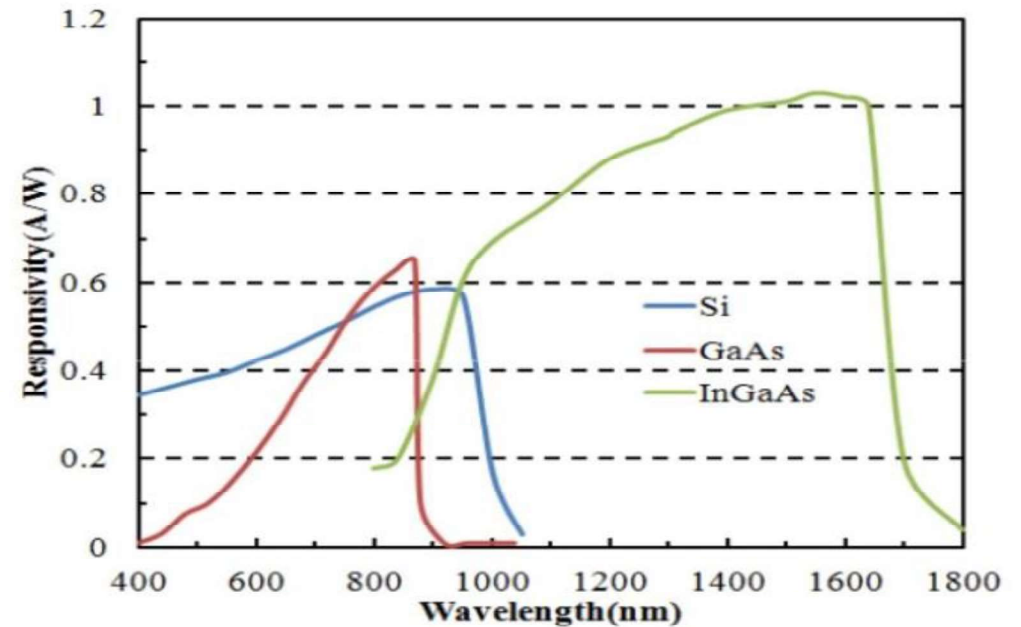
Competitive Advantage In TYNTEK

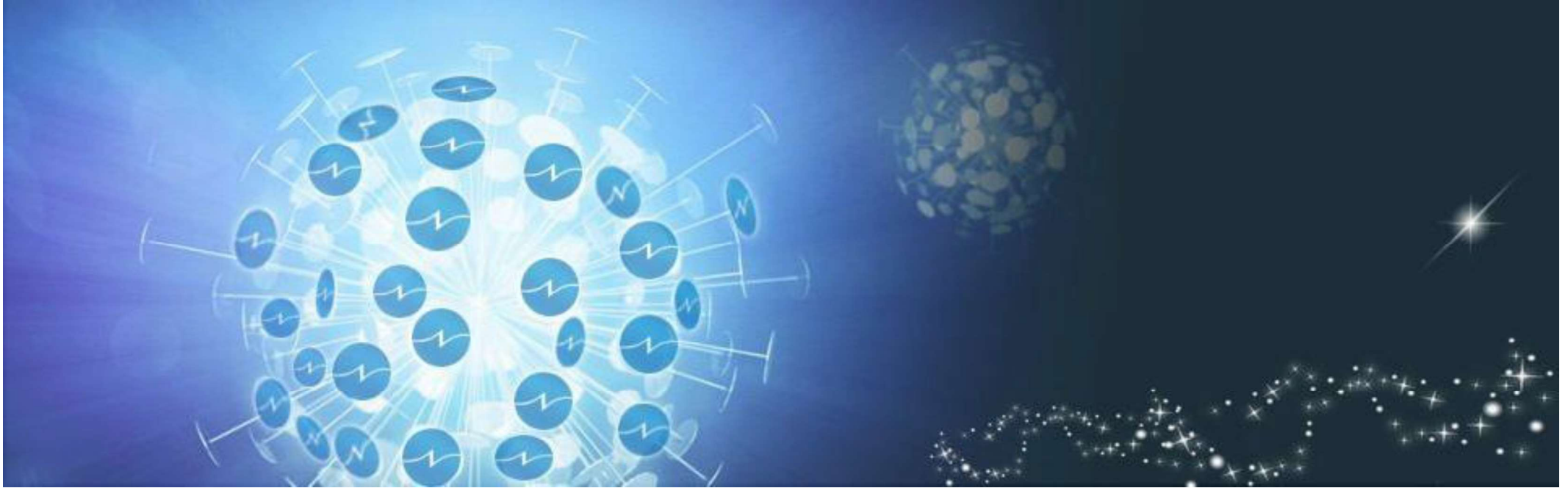
- Experienced Chips Manufacturer

- * Design and chips manufacturer for more than 30 years
- * High volume production capacity over 4,000 million pcs/ Month

- Wide Range Solution

- * Compound LED from 550nm to 1,500nm.
- * Receiver sensor from 220nm to 1,600nm





Thank You

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<http://www.tyntek.com.tw>

T;031-905-0968 / 070-8018-4191 F; 02-6230-9269 E-mail ; marketing@aceroyal.co.kr <http://www.aceroyal.co.kr>



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