COMPANY INTRODUCTION

RAYSTAR
Display Solution Provider

曜凌光電股份有限公司
RAYSTAR OPTRONICS, INC.

• 2023- 03

Group Introduction

Group Overview

Established

Oct 1998
Taiwan

Founder

Dr. Venson Liao

Group Capital

US$ 43.37 Million

Employee

1,130

Vision & Mission

【Vision】

The world's leading brand of industrial display solutions.

【Mission】

Create the most significant contribution to shareholders, employees, society, and the environment, and continue sustainable development.

【Core Value】

Comply with the code of ethics, conserve good moral character, and observe the law.

【Culture】

Trust, Innovation, Technology & Sustainability.

Awards

Taiwan Excellence Award 2022
CTSP Innovative Product Award 2022
National Manager Excellence
Award 2022
Workplace Work Equal Rights
Excellent Institution Award 2022.

20 22

Taiwan Excellence Award 2021
CTSP Innovative Product Award 2021

20 21

Workplace Work Equal Rights Excellent Institution
Award 2020

20 20

Taiwan Excellence Award 2019
CTSP Innovative Product Award 2019

20 19

20 18 Taiwan Excellence Award 2018

Taiwan Excellence Award 2017
National Industrial Innovation Award 2017

20 17

20 16 CTSP Innovative Product Award 2016
Taichung Industrial Innovation Award 2016

CTSP Innovative Product Award 2015
Taichung Industrial Innovation Award 2015

20 15

20 14 Taiwan Excellence Award 2014
Outstanding Photonics Product Award 2014

Taiwan Excellence Award 2013
CTSP Innovative Product Award 2013
36th Model of Taiwan Assistant Award
36th Model of Taiwan Entrepreneurs

20 13

20 12 CTSP Innovative Product Award 2012
Outstanding Photonics Product Award 2012

CTSP Innovative Product Award 2011
Taiwan Excellence Award 2011
AutoTronics Innovation Award 2011

20 11

200 7 The 16th National Award of Outstanding SMEs

RAYSTAR

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Winstar Group Locations

LCM Facility
Dongguan, China

Branch
Hubei, China

LCM Facility
Jiang Su, China

Subsidiary
Los Angeles, USA

Operations Center
Taichung, Taiwan
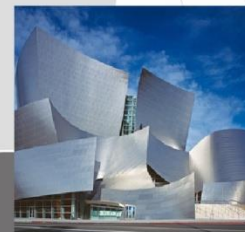
Raystar
OLED Panel Facility
Taichung, Taiwan

Raystar Optronics, Inc

Central Taiwan Science Park

Taichung, Taiwan

- ✓ Founded in 2007
- ✓ PMOLED Display Manufacturer
- ✓ Small to medium sized display.
- ✓ OLED modules, STN/FSTN LCM, TFT
- ✓ System Integrated Solution
- ✓ Smart Display
- ✓ Custom Solution

RAYSTAR

OLED Production lines

OLED Manufacturing Facility
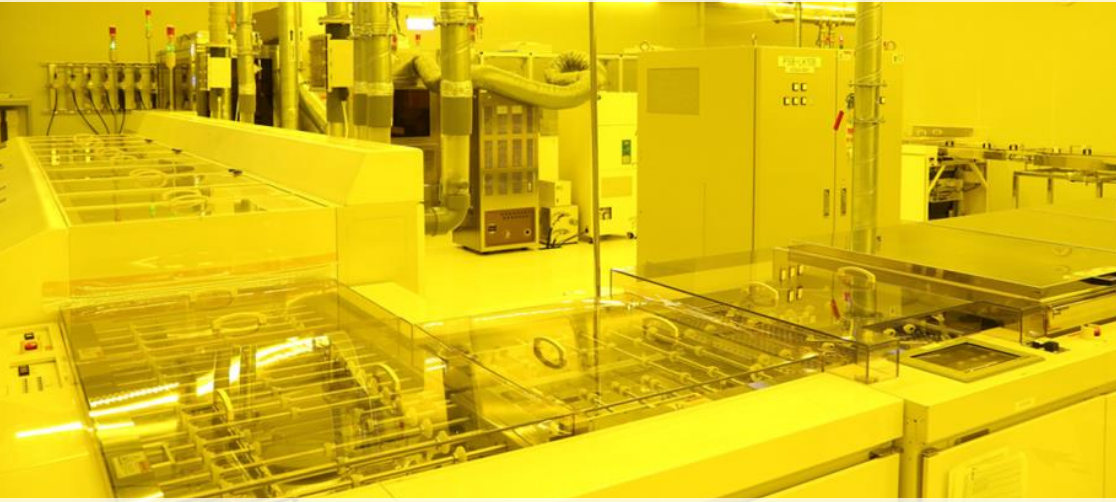
Location : Central Taiwan Science Park, Taiwan

Paid-in Capital : US$ 14.49 Million

OLED Panel Production
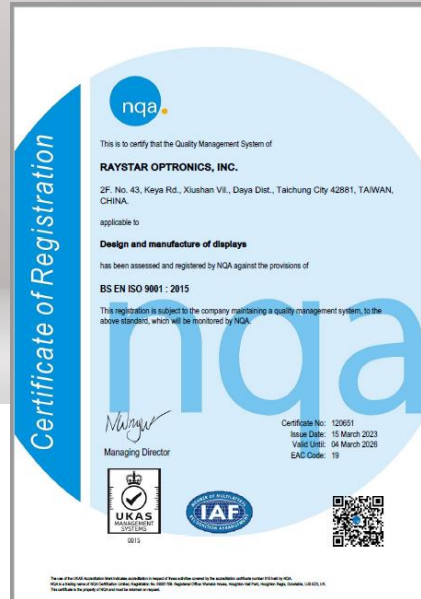
Since 2007

OLED Lithography

Sputter Facilities

OLED Evaporation
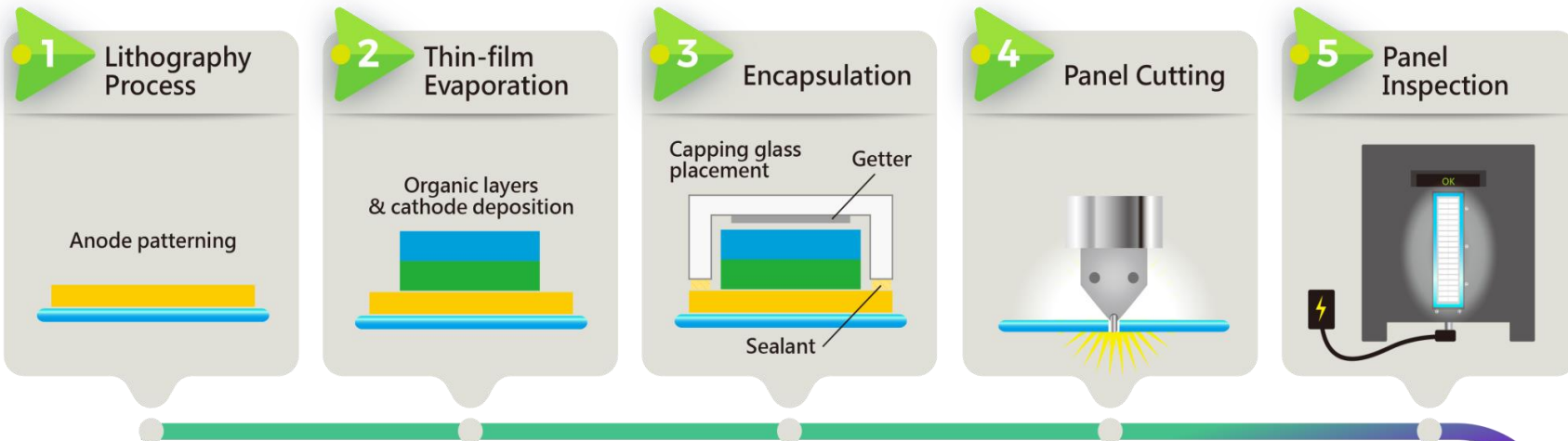
Certificates

- ☑ **ISO 9001: 2015**
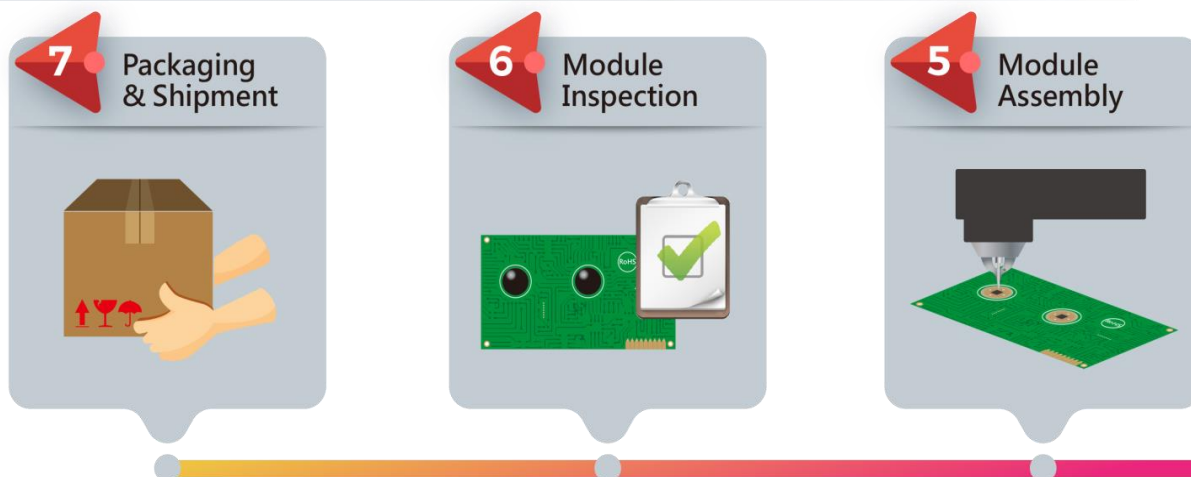- ☑ **ISO 14001**
- ☑ **RoHS & REACH compliance**
- ☑ **IATF16949**

OLED Fabrication Flow

🟨 Panel Process in Taichung RAYSTAR

1 Lithography Process

Anode patterning

2 Thin-film Evaporation

Organic layers & cathode deposition

3 Encapsulation

Capping glass placement — Getter

Sealant

4 Panel Cutting

5 Panel Inspection

OK

🟪 Module Assembly in Changs hu WINSTAR (China) **Or in Taichung RAYSTAR**

7 Packaging & Shipment

6 Module Inspection

RoHS

5 Module Assembly

RAYSTAR

Product Lines

OLED

TFT

System Integration

STN

Thin / Low Power/ Aesthetic requirement

- Passive Matrix OLED
- 0.49" ~5.5"
- Wide range of product applications
- High Contrast/ Brightness / Wide view angle
- Can replace STN or VFD
- No need for backlight / Low power consumption
- High Tech manufacturing，Price higher than STN
- Thin, colorful/Transparent/ bendable options

Colorful & High-definition requirement

- Colorful display
- 0.96" ~15"
- Custom solution
- Complex to design
- High definition & higher resolution

Integrated services requirement

- Integrate panels, software, firmware, hardware, and enclosures solutions
- Lower development costs
- Speed time-to-market
- Modularization, reducing customer material inventory.
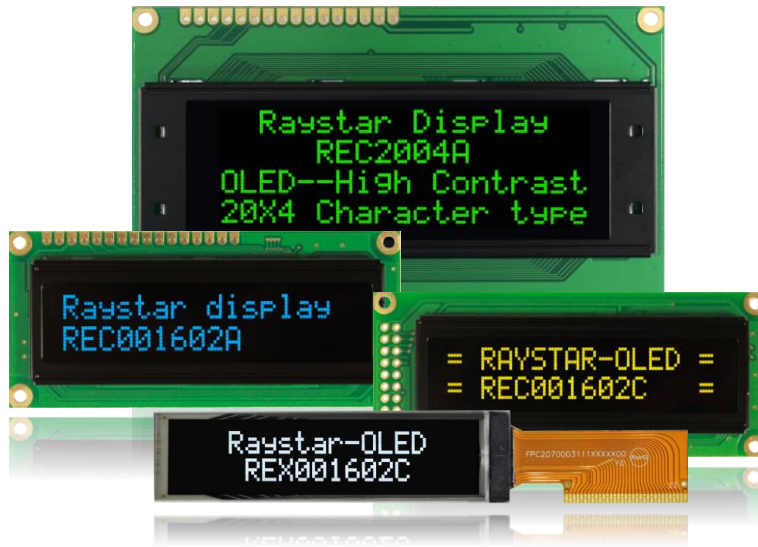- Simplify customers' production processes.

Simple Display Cheap and easy to use

- Monochrome
- Under 6"
- Wide range of standard items
- Wide range of product applications
- Easy to design
- Cheap and easy to use
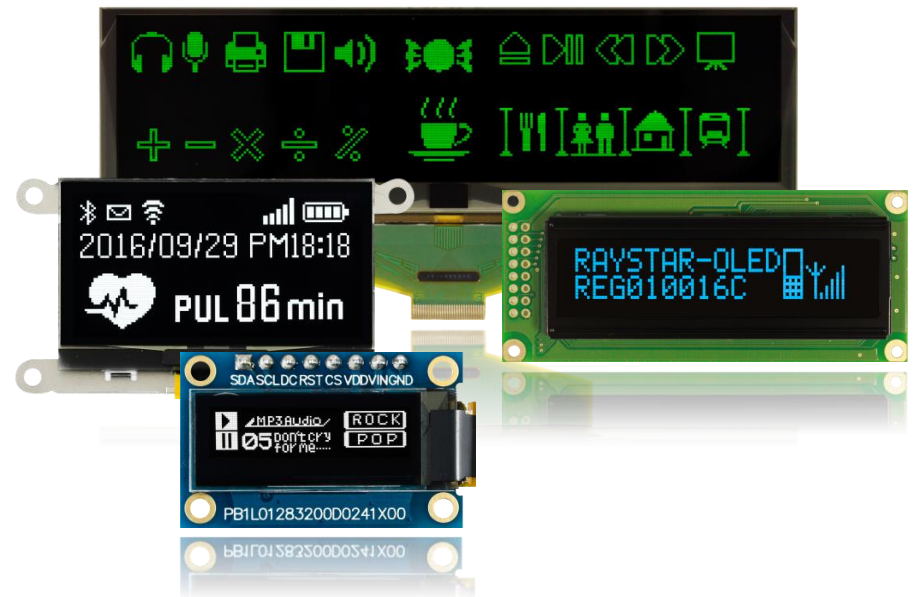- Low MOQ
- Low tooling fee
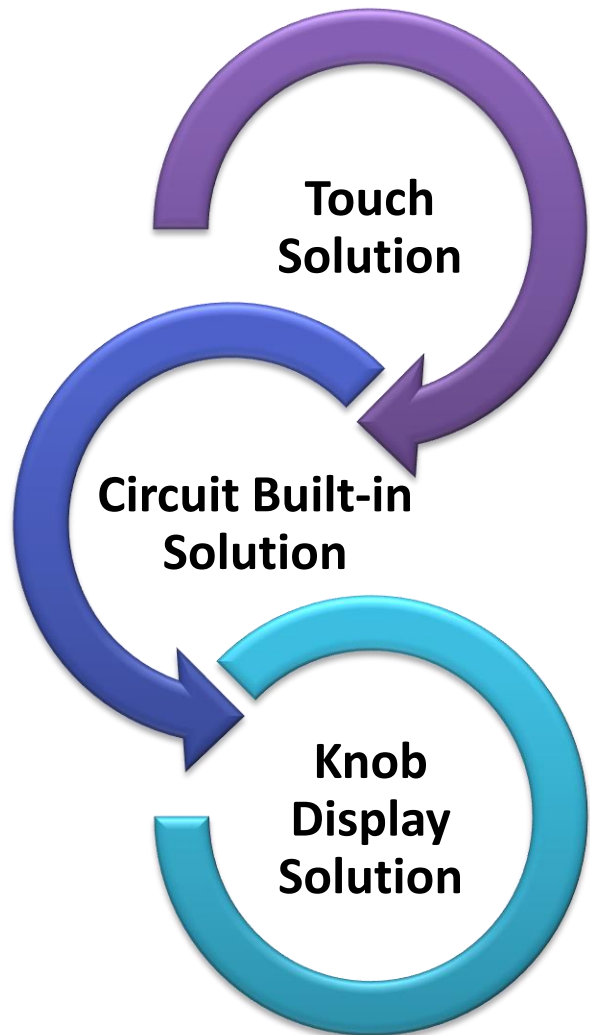
RAYSTAR

Product Line - OLED

▶ Character OLED

▶ Graphic OLED

Advanced Solutions for OLED Displays

Touch Solution

Circuit Built-in Solution

Knob Display Solution

Not only the display supplier , We can be your display solution provider.
The more we do, the more we can do.

Touch OLED Solution Product List

Knob Display Product List

AA Φ 1.12"

Size: 1.18 inch

128 x 128 Dot Matrix

Built-in controller SSD1327

3V Power supply

1/128 duty

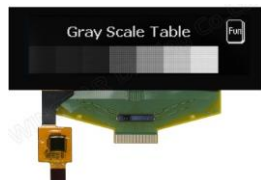Interface: SPI, I2C

Capacitive Touch Screen
(CTP)

Detect Point : 1 Finger

REX012864Z

37.4

1

22.5±0.5

AA 0.96"

Size: 0.96 inch

128 x 64 Dot Matrix

Built-in controller
SSD1306

3V Power supply

1/64 duty

Interface: SPI, I2C

Smallest !

RAYSTAR
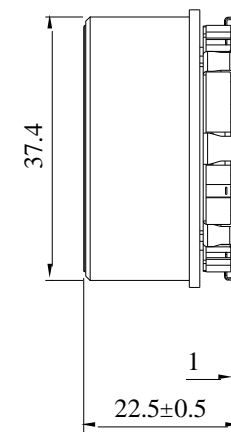
Circuit Built-in Solution

- A easy Way to setup the OLED Panel

- Built-in power circuit fastens the application developing

- Reserve 2.54mm Pin Hole to help connecting easily

- Use serial interface to save the PIN number

- Support 3V/ 5V input voltage
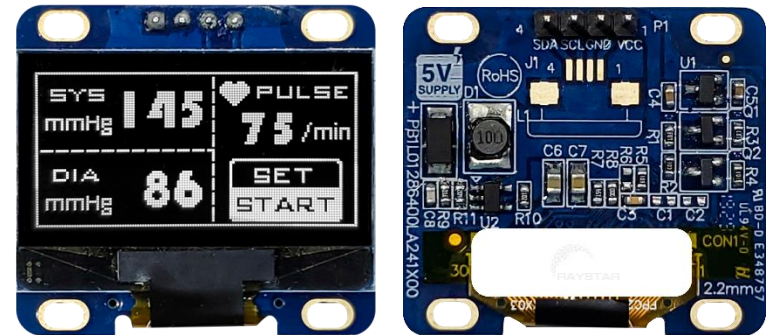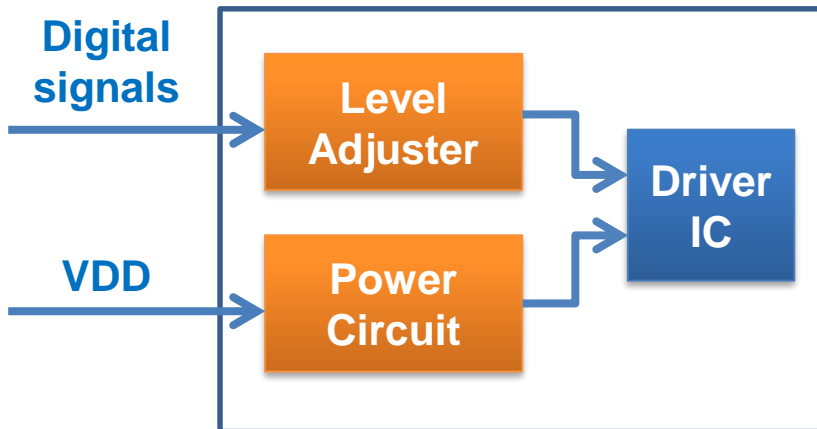
Circuit Built-in Solution
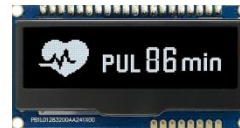
Feature - Character Font

Display Type	OLED	LCD	VFD
Built in Font ROM	4 types fonts in one IC	1 type fonts in one IC	2 types fonts in one IC

RS0010 OLED COB IC

✓**Raystar Design only**

✓**Pattern in Taiwan and USA**

✓**Fonts available**

1. **English Japanese font**

2. **Western European I font**

3. **Western European II font**

4. **English Russian font**

ICON / Segment Custom Overview

- Pro : Custom, Smooth Shape
- Con: NRE, Developing time
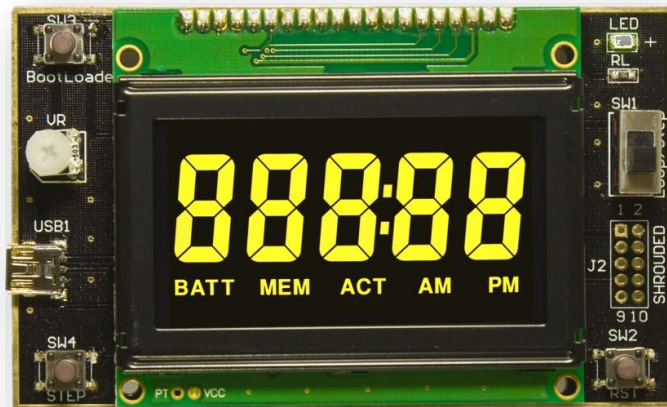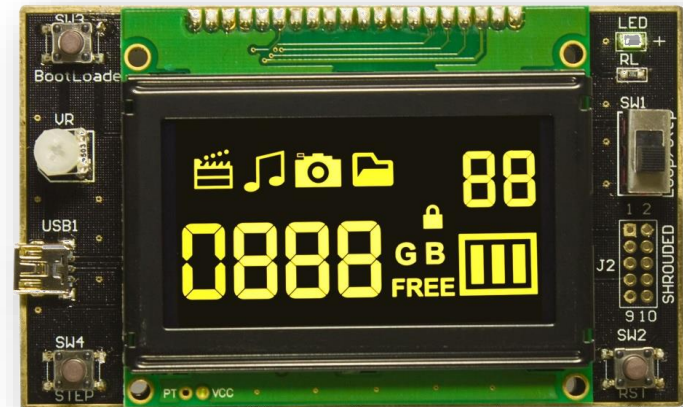
OLED Custom Design Rules

OLED Overview : Design Rule

Dot Gap
22um*22um

Dot Size
150um*150um

Bonding width 4mm @ COG

Bonding width 2mm @ COF

Border(AA to OD)
>2.0mm

Active Area
0.49 ~ 6 inches

Pixel Pitch
≧172 um

Pixel Size
≧150 um

COG
Inch:0.49"~6"
Resolution:160*160

COF
Inch: 5.5"
Resolution:256*64

ICON
Inch:7"
Segment:256~384

COB
Inch: 5.85"
40* 2 Characters

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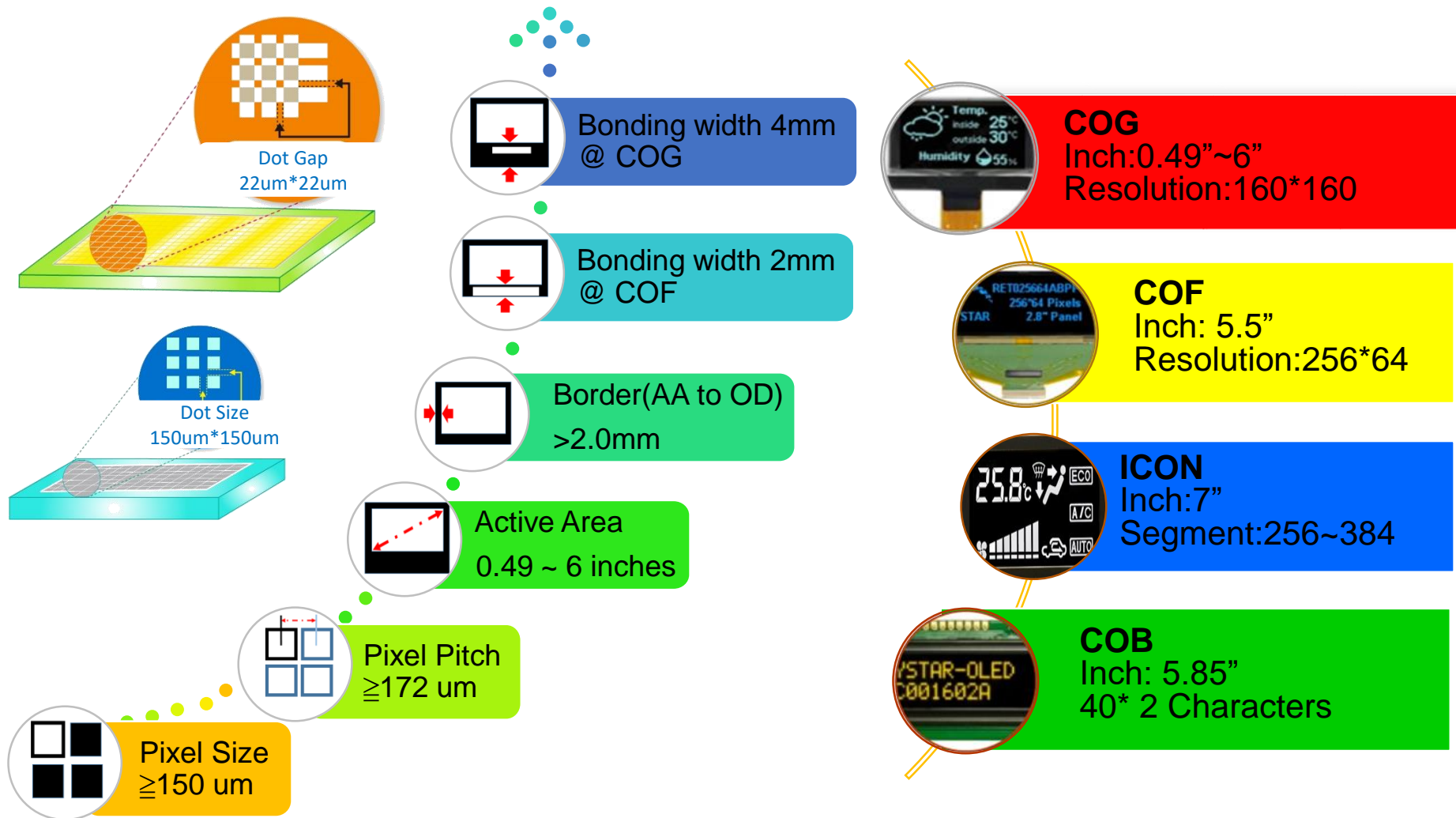
2022 - 2023 OLED Product Roadmap

	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023 Q1	2023 Q2	2023 Q3

Change to competitive Driver IC

	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023 Q1	2023 Q2	2023 Q3
Mono-chrome	128*64 @ 0.96" SSD1315 — Industrial	128*64 @ 1.54" CH1116 — Industrial	128*64 @ 2.4" CH1116 — Industrial	128*64 @0.96" SSD1315 dual color (Shrink) — Consumer	64*48 @ 0.66" SSD1315 — Consumer	128*32 @ 0.91" SSD1315 — Consumer	5.77" 20ch * 2L — Industrial
	128*64 @ 0.96" ST7315 — Industrial	128*32 @ 2.23" SH1106 — Industrial	128*64 @ 2.7" CH1116 — Industrial	128*32 @1.71" CH1116 — Industrial	64*32 @ 0.49" SSD1315 — Consumer		
Grayscale support	128*128 @ 1.5" CH1120 — Industrial				128*128 Φ 1.2" CH1120 — Industrial	160*64 @ 1.21" CH1120 — Industrial	High resolution display — Industrial
					256*64 @ 3.12" SH1128 — Industrial	256*64 @ 2.8" SH1128 — Industrial	256*64 @ 5.5" SH1128 — Industrial
PCB optional	128*32 @ 1.17" COG + PCB — Industrial	64 * 128 @ 0.96" Portrait COG + PCB — Industrial	96*16 @ 0.69" COG + PCB — Industrial	128*128 @ 1.12" COG + PCB — Industrial		Touch Solution	128*32 @ 1.71" In-cell — Consumer
Multi-interface	256*64 @ 3.55" CAN protocol — Industrial			UART/ Bluetooth/ USB — Industrial			

Completed	**Confirm**	**Planning**

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OLED - Advantages

World Patented

COB Character type patented
Customers can upgrade from STN LCD
to OLED displays easily.

Standard items

Up to 1,875 standard items.
Low MOQ for most of standard
items (White & Yellow color)

Industrial Grade

Best product reliability
10 years supply guarantee

Fast

Response time
At " +25℃ - 10μ Sec "

OLED Key Equipment

Raystar has L1, L2, L3, and L4, which are expensive,
difficult to obtain, and high-quality key evaporation
equipment needed for future growth momentum.

Thin

No need for backlight
Self-emitting

Low

Power consumption

High

Contrast
Brightness

Wide

Super View angle
"Up to 175 degree"

Long

Lifetime

Wide

Operation temperature
"-40 ℃ ~ +80 ℃ or 85 ℃ "

ECO Friendly

RAYSTAR

Product Line - TFT

▶ TFT Panel Series

▶ Bar Type 5.2",4.6",3.9"
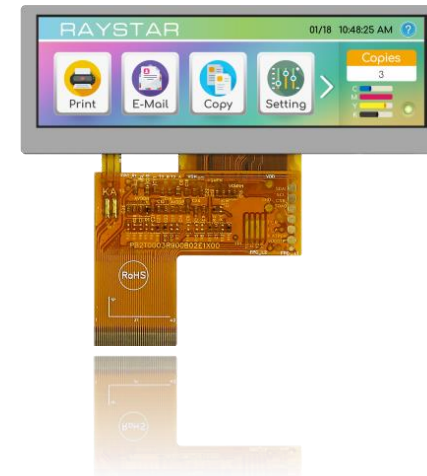
▶ TFT control board

▶ Mono TFT

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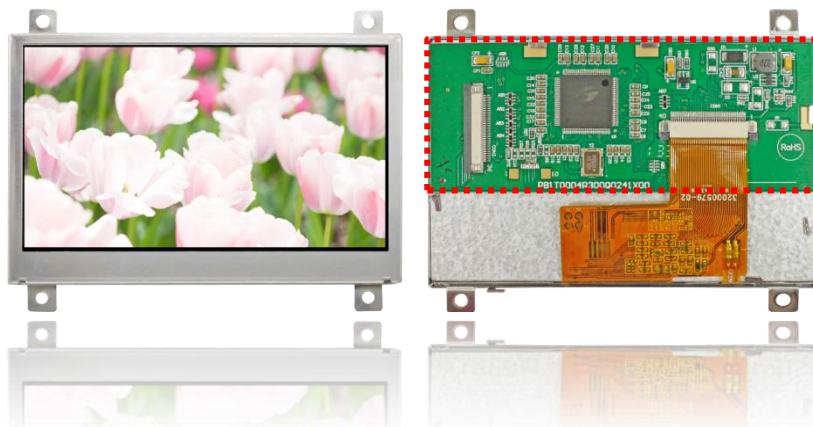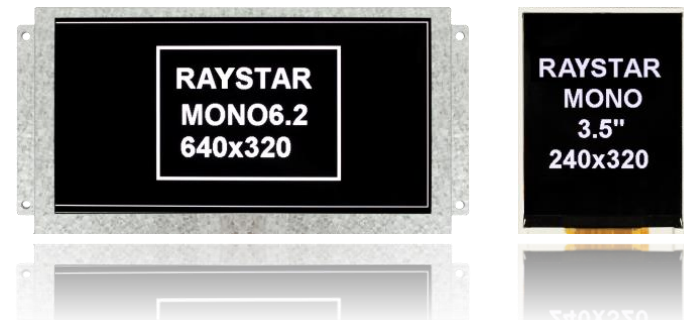
Product Line - TFT

▶ Wide Temp.
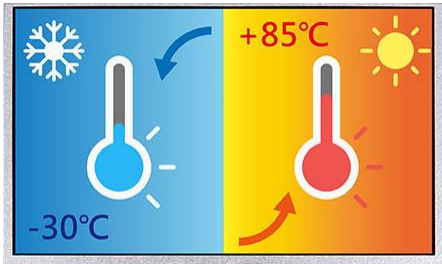
▶ High Brightness

▶ IPS
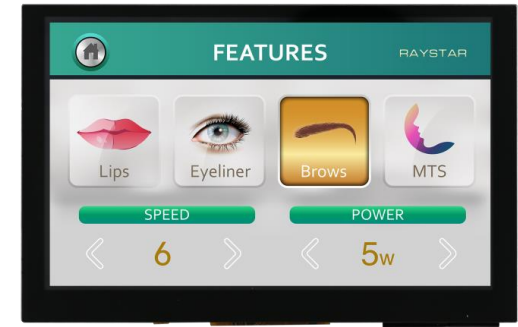
▶ LVDS TFT

▶ MIPI TFT

▶ HDMI TFT
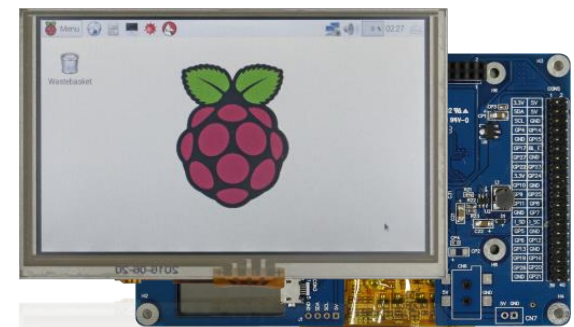
2023 TFT Product Roadmap

2023 Q1

SPI

TFT 1.54" (IPS)
240×240
Top: -20°C~+70°C

2023 Q2

EDP

TFT 7" (IPS)
1024×600
Top: -20°C~+70°C

2023 Q3

EDP

TFT 15.6" (IPS)
1920×1080
Top: -20°C~+70°C

2023 Q4

RGB

TFT 5" (Transflective)
800×480
Top: -20°C~+70°C

RAYSTAR

TFT - Advantages

Broadest TFT Selection
- Up to 2328 production items
- offering broadest TFT selection

O1

Variety Solutions
- Multiple interface options
- Capacitive touch panel options
- Resistive touch panel options

O2

Bar TFT
- The first 5.2" Bar TFT in the global marketplace
- 3.9" Bar TFT by self-produced

O3

Advantage

Custom Design
- Control board development
- Custom FPC service
- Semi-custom service
- Custom Touch solution

O4

Promote items w/o MOQ
- Low-Volume/High-Mix business model
- 90% items without MOQ

O5

Industrial applications
- Best product reliability
- 3 years supply guarantee

O6

System Integrated Solution

Communication interface design
CAN / RS232 / RS485 / USB

GUI Programming

Inputs for User Interface
- Custom Touchscreen
- Membrane Switches / Tact Switches
- Silicon keypads

Driver boards

Custom TFT / OLED / STN / Segment LCD

Full embedded display solutions

Multi-language Font

Output interface
- GPIO contact point
- Custom Display rendering of User Interface

PCB Custom shape & size

Mounting options & methods

RELAY

FOOD MANAGER

596 steps
0.26 mi 21kcal

777777

Smart Display Introduction

> A product that integrates display and MCU with UI bundled

> With user friendly SW app. to design your own UI

> Multi-options for panel size and default scenarios

Link to demo video on Raystar website: **Smart Display GUI Builder Demo**

Features of Smart Display

Design without writing a line of code. Speed up the time to market
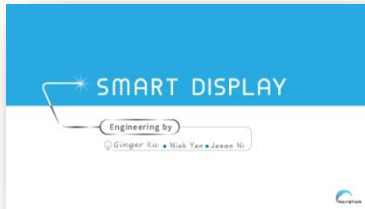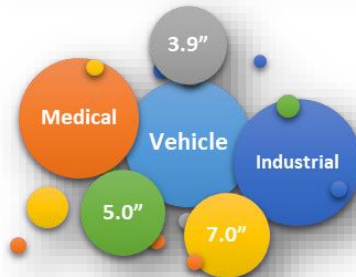
RAYSTAR GUI Builder

Design the UI by Dragging Objects Instead of **CODING ALL DAY LONG**

Design for Multi-pages by your own

Simulate directly without HW device needed

Wealth and flexible application **coverage**

- Multi-**HOST** choice
- Multi-Display Size
- Default 3 types of scenario format

CAN

RS485

UART

3.9"

7.0"

3.5"

10.1"

4.3"

5.0"

Raystar can help!

We can also customize your own display if the above doesn't meet your requirement.

System Integrated Solution

Specification for SmartDisplay Standard

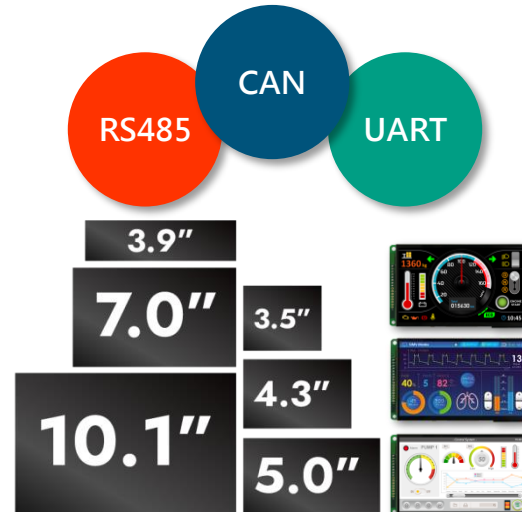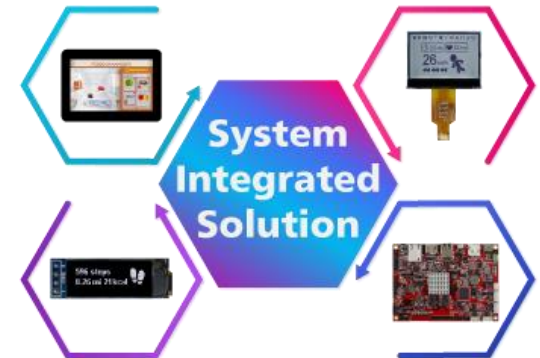|										
Panel Size	**10.1"**	**7.0"**	**7.0"**	**7.0"**	**5.0"**	**5.0"**	**3.9" Bar type**	**4.3"**	**4.3"**	**3.5"**	**3.55"**
Resolution	1024×600	1024×600	1024×600	1024×600	800×480	800×480	480×128	480×272	480×272	320×240	256×64
Aspect Ratio	16:9	16:9	16:9	16:9	16:9	16:9	Bar Type	16:9	16:9	4:3	Bar Type
Touch	CTP	CTP	CTP	CTP	CTP	CTP	CTP	CTP	CTP	CTP	CTP
View Direction	IPS	IPS	IPS	IPS	IPS	IPS	TN	IPS	IPS	IPS	**PMOLED**
Brightness(nit)	400	400	**800**	400	300	300	300	300	300	300	80
MCU Processor	STM7 series	STM7 series	STM7 series	STM7 series	STM4 series	STM4 series	STM7 series	STM7 series	STM7 series	STM7 series	STM7 series
ROM size	1M	1M	1M	1M	2M	2M	64K	64K	64K	64K	64K
Communication Interface	CAN BUS	CAN BUS	CAN BUS	**RS485**	CAN BUS	**RS485**	CAN BUS	CAN BUS	**RS485**	CAN BUS	CAN BUS
Interface Protocol	CAN open	CAN open	CAN open	Modbus	CAN open	Modbus	CAN open	CAN open	Modbus	CAN open	CAN open
Flash Memory	16M	16M	16M	16M	16M	16M	16M	16M	16M	16M	16M
Operating voltage	5V~12V	5V~12V	5V~12V	5V~12V	5V	5V	5V	5V	5V	5V	5V
Operating temp.	-20~70	-20~70	-20~70	-20~70	-20~70	-20~70	-10~70	-30~80	-20~70	-20~70	-20~70
SW Application	GUI Builder 										
Default Scenario support	Industrial Vehicle Medical										General
Build in Buzzer	YES										

Smart Display Product Roadmap

2023 Q1	2023 Q2	2023 Q3	2023 Q4

CAN bus

10.1
7.0 / 7.0HB
5.0 / 5.0HB
4.3 / 3.9
3.5 / OLED
CANopen

CAN bus

4.3" TFT/IPS
Custom CAN ID

RS485

10.1 / 7.0
5.0 / 4.3
Modbus

**Multi-I/F for
EV charger HMI**

HB 7" TFT/ IPS/ CTP/ Hover Touch
HW: CAN + RS485 + LAN + Wi-Fi
Protocol: OCPP
Peripheral: NFC (optional)
Landscape

CAN bus

10.1" TFT/IPS
Custom CAN ID

CAN bus + GPIO

10.1" TFT/IPS
CANopen

**Air Purifier
Bluetooth**

1.77" TFT/TN
Customize
Landscape

CAN bus

7.0" TFT/IPS
Custom CAN ID

CAN bus

5.0" TFT/IPS
Custom CAN ID

GUI builder

New features:
• Open more object
  design function
• Add/delete object style
• Page switch by touching
  the button

**Coffee Machine
Bluetooth**

128x64 OLED
Customize
Landscape

CAN bus

3.5" TFT/IPS
Custom CAN ID

*High-End
series*

UART

4.3" TN/Touch
Customize

UART

4.3" TN/N-Touch
Customize

UART

3.5" TN/No-touch
Customize

*Entry
series*

Bluetooth	**RS485**	**CAN bus**	**CAN bus**	**RS422**	**USB**
0.96" TFT/IPS	*12.3" , 8.8", 4.3", 2.4"*	4.3" TFT/IPS	7.0" TFT/IPS	*256x64 OLED*	*5.2" IPS*
Bluetooth	Modbus	CAN open/Camera	*J1939*	Modbus	UART
Landscape	Landscape	Landscape/*Portrait*	Landscape	Landscape	Landscape

Launched	Developing	Customized

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Product Line - STN

▶ COG LCM

▶ Graphic LCM

▶ VATN LCM

▶ Character LCM

▶ LCD Panel

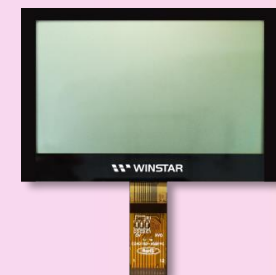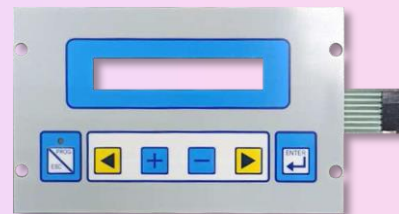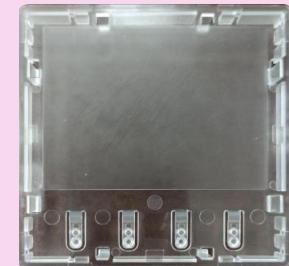# STN - Custom Solution

Select the IC
Available in the Market

Programming MCU

Software

Hardware

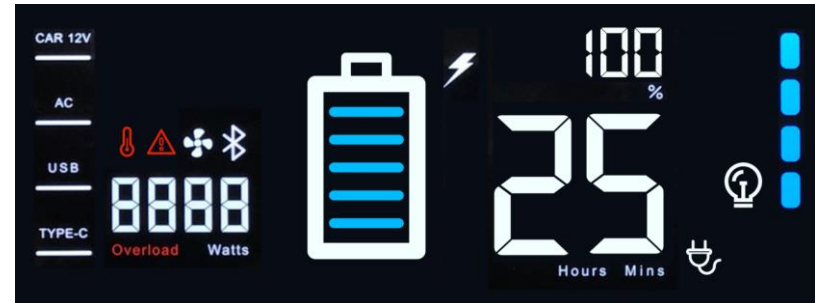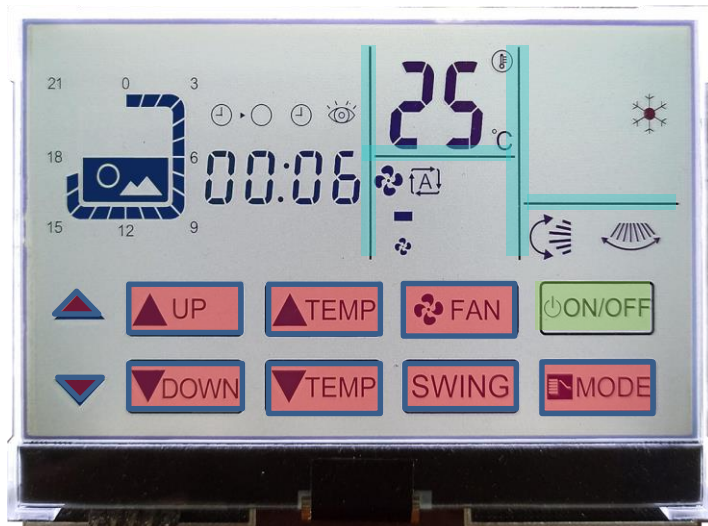Customized Appearance

RG320240B
RAYSTAR

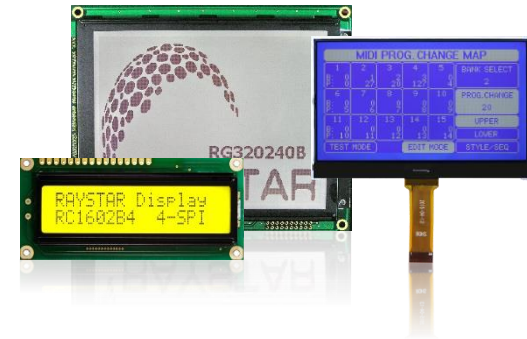# STN - Silk Printing Screen

▶ Measuring equipment

▶ Power Bank Printing

▶ Touch Function with Silk Printing

STN - Advantages

Largest STN Selection
- Up to 8100 items.
- offering the broadest selection

High Cost Performance
- Competitive Price with best quality
- World No. 1 Cost-performance ratio

Custom Solution
- COG/COB/SMT
- Total Custom Design
- Semi-custom Design
- Silk Printing Screen

Low MOQ
- 90% standard items have low MOQ
- Hot sale items have no MOQ.

Industrial Grade
- Best product reliability
- 10 years supply guarantee

O5
O1
O2
O3
O4

Advantage

RAYSTAR

Main Applications

▶ Industrial Machine

Security System

Telecom Product

White Goods

Audio System

Medical device/Equipment

▶ POS System

Cloud / IoT

Intelligent Technology

Wearable Device

Smart Home

3D Printing

Meter device

Energy System / Equipment
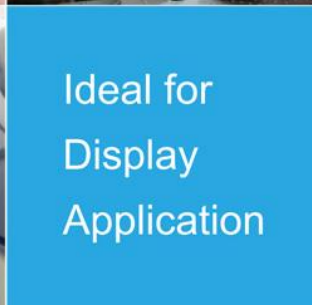
Thin Design Best Performance

Ideal for Display Application

Core Competencies

12,500 Standard Products

Raystar offers the broadest product selection in the market and the most comprehensive customers worldwide.

2,328 items

8,129 items

TFT

STN

OLED

S I

1,875 items

169 items

Total : 12,501 module items

- **Four Product Lines**: Raystar is the only display manufacturer worldwide that provides STN, TFT, OLED modules, and System Integration. Our combination of various product portfolios can meet any display needs for customers.

- **Broadest product selection**: With the most comprehensive range of STN/VATN/TFT/OLED display products, a total of about 12,500 models, adopting our standard products, customers can save the tooling cost, lower development cost, and speed time-to-market.
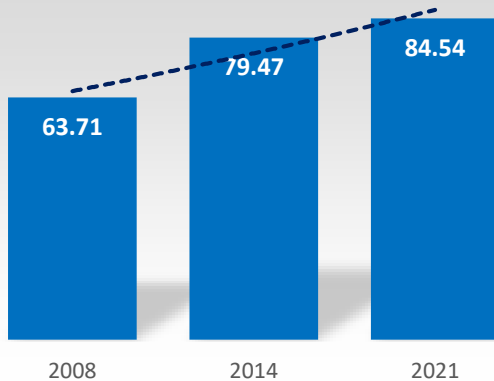
RAYSTAR

Industry Category Proportion

Industry	Examples of Main Application	%
Industrial Control	● IoT System, Temperature control, Commercial Ice Machine, Garbage Disposal Machine, Vending Machine, Industrial Control System, Automatic Control System, Air Purifier, Power Control System, Military Equipment, Measuring Instrument, Laboratory Equipment	45%
Home Application	● Refrigerators, Ovens, Coffee Machine, Microwave Oven, Dishwasher, Dish Dryer, Air Conditioner, Vacuum Cleaner, Sewing Machine, Security System, Elevator, Food Processor, Temperature and Humidity Controller, Heater	14%
Entertainment & Audio	● Digital Broadcasting, Mixer, Audio System, Electronic Keyboard, Robot Screen, Gaming Machine, Musical Instrument, Wearable Device, Home Projector, Electronic Toy, Remote Control Device, Digital Camera, Audio Power Amplifier, Coin Changer Machine	11%
Netcom	● Router, POS system, Mobile Payment Machine, VOIP System, Storage Device, Credit Card Machine, Composite Printer, Signal Transmission Machine, Server System, Cable System, Recognition Machine	11%
Healthcare	● Ventilator, Oxygen Concentrator, Blood Glucose Meter, Blood Pressure Monitor, Portable ECG, Treadmill, MRI Equipment, Thermometer, Endoscope Equipment, Sterilization Machine, Hemodialysis Machine, Medical Lighting Control, Low-Frequency Therapy Massager	8%
Energy	● Energy meters, Smart meter, Digital meters, Oil Drilling Rig Equipment, Testing instrument for Green Energy (solar & wind), Fueling Machine, Portable Gas Detection System, PV Inverter	5%
Transportation	● Aircraft Oven, EV Charging Station, Drone Controller, HUD Display, Aviation Radio System, GPS Positioning System, Automotive Test Equipment, Tire Pressure Monitoring System, Ticket Inspection Machine, Car Audio System, Marine Navigation System, Power Station, car control system, After-market Navigation, Bus Ticketing Machine, Car Gear Knob	5%
Blockchain	● Bitcoin Wallet, Cryptocurrency wallet	0.5%
Others	● Others	0.5%
Total		100%

CAGR Surpasses Market

Global GDP (trillion, USD)	Taiwan GDP (billion, USD)	WS Group Rev. (million, USD)
CAGR : 2.04%	**CAGR: 3.66%**	**CAGR: 7.82%**

Global GDP (trillion, USD)

- 2008: 63.71
- 2014: 79.47
- 2021: 84.54

Taiwan GDP (billion, USD)

- 2008: 437.17
- 2014: 541.94
- 2021: 723.69

WS Group Rev. (million, USD)

- 2008: 32.33
- 2014: 52.27
- 2022: 100.37
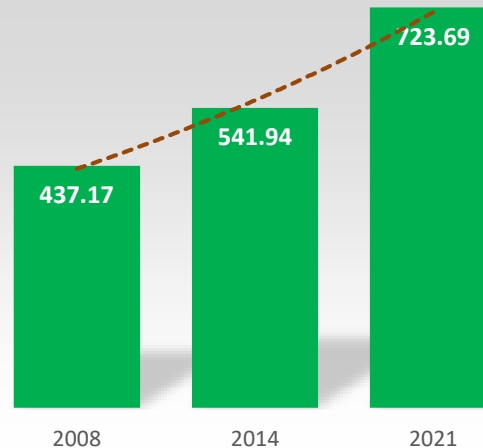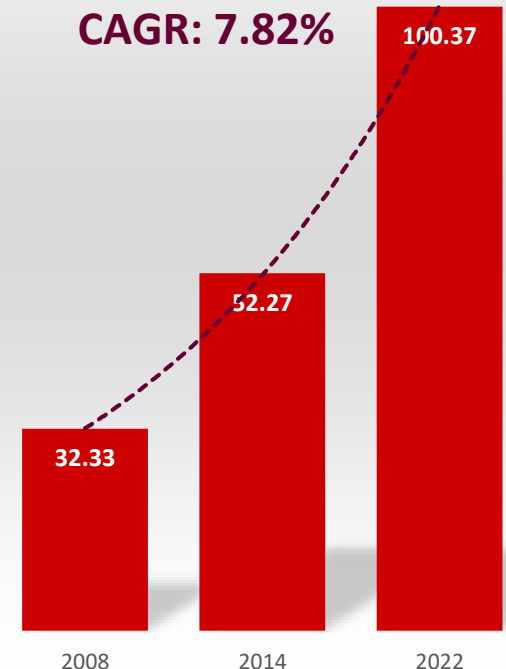
WS Group CAGR accelerated to 11.5% in the past four years.

RAYSTAR

WS Group Revenue

2008~2022 Revenue

USD Million
Rate by US$1:NT$30

Why RAYSTAR

We Focus on your projects

Wide Range Product
OLED/ TFT/ STN/ Embedded Standard
System Integrated Solution
Custom Solutions

Best Quality
Best competitive price
High Cost Performance

Customer Service
Customer Oriented Policy
Marketing & Technical Support

Innovation Technology
Low-Volume/ High-Mix(LVHM)
Efficiently production control of LVHM

Trust Sustainability
Industrial Display manufacturing
RoHs and ISO Compliances

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