

TRULY® 信利

TRULY®

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**Innovation-Driven Development
Creating a Better Future**

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01 Truly 

Company Profile

Truly is the largest-scale professional manufacturer of automotive smart display and the biggest smartphone key components manufacturer in China. Main products are capacitive touch panel, high resolution camera module, small & middle size display module, fingerprint identification module, patterned glass shell and touch display integrated module.



Truly International Holdings Ltd (“Truly Group” for short) was founded in 1978 and the headquarters is located in Hong Kong while the production factory is in Shanwei and Huizhou City of Guangdong with the total area of 1,000,000 + square meters. Truly was listed in Hong Kong Stock Exchange in 1991(stock code:00732.HK). Truly has concentrated on developing, manufacturing and marketing smart display since its establishment, Truly products has been widely applied to mobile phone, tablet PC, automotive, industrial and medical applications.



Truly has passed complete quality and environmental protection system authentication:

- ISO 9001: 2008 for LCD panels and module (1995)
- ISO14001: 2004 Environment Management System (2000)
- TL9000-H R5.5/R5.0 Telecommunication Quality System (2002)
- ISO/TS16949: 2009 Automotive Quality System (2003) QC08000
- (ROHS): Hazardous Substance Process Management (2008)



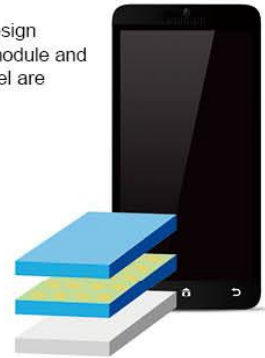
02 Mobile Terminal



Providing One-stop Solution of Display, Touch Panel, Camera, Lens and Biological Recognition

Full In-cell integrates touch and display function, which can achieve much simpler module structure. The display performance is enhanced. With much thinner thickness and narrower bezel, Full In-cell is becoming middle and high-end smart phones' first choice compared with hybrid In-cell.

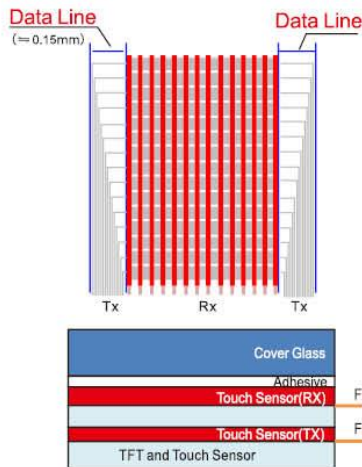
Normal design
(Display module and touch panel are discrete)



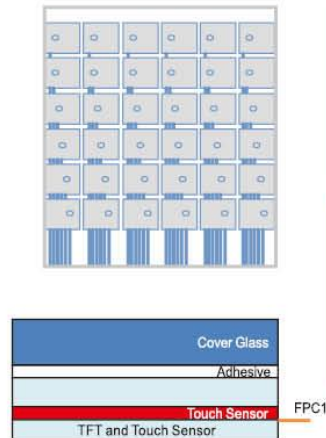
Full In-cell
(display module and touch sensor are integrated)



● Hybrid In-cell



● Full In-cell



Performances	SNR	50DB	45DB
	Passive stylus pen	2.0mm	2.5mm
	Glove	5mm	2mm
	Water proof	good	ordinary

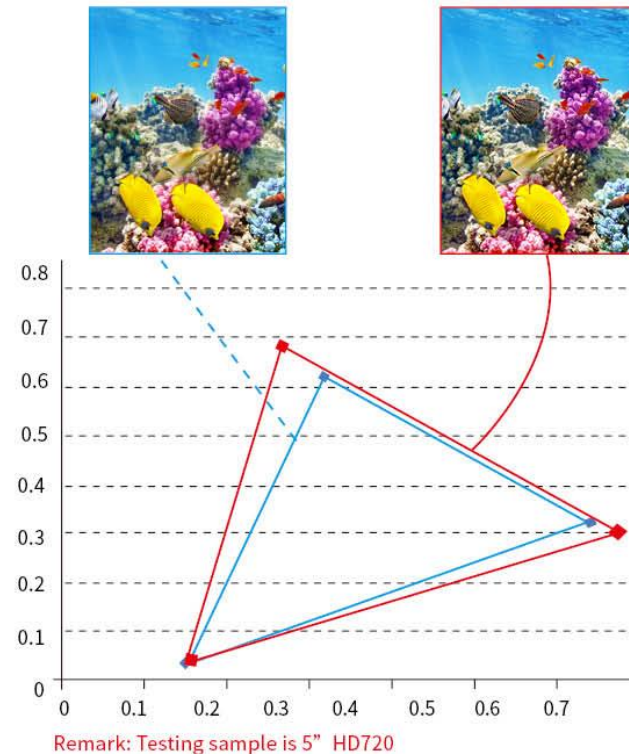
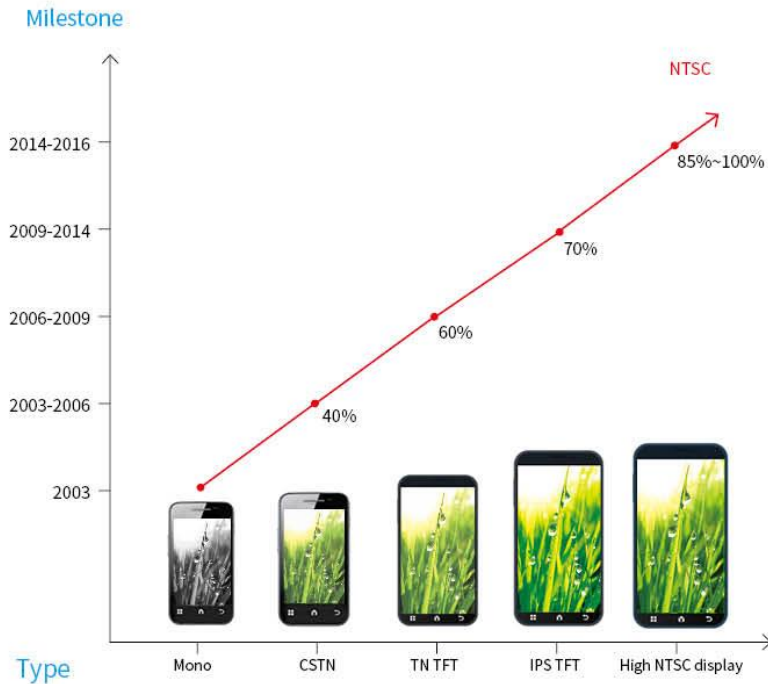
Outdoor Readable	ITEM	FIC	Hybrid
	Transmittance	100%	98%
	ACR	1.8	1.4
	Reflective ratio	5.5%	7.3%
Pattern	none	have	

Narrow-bezel	ITEM	FIC	Hybrid
	Glass thickness	0.25t	0.3t ↑
	Bezel increased	0	+0.15mm

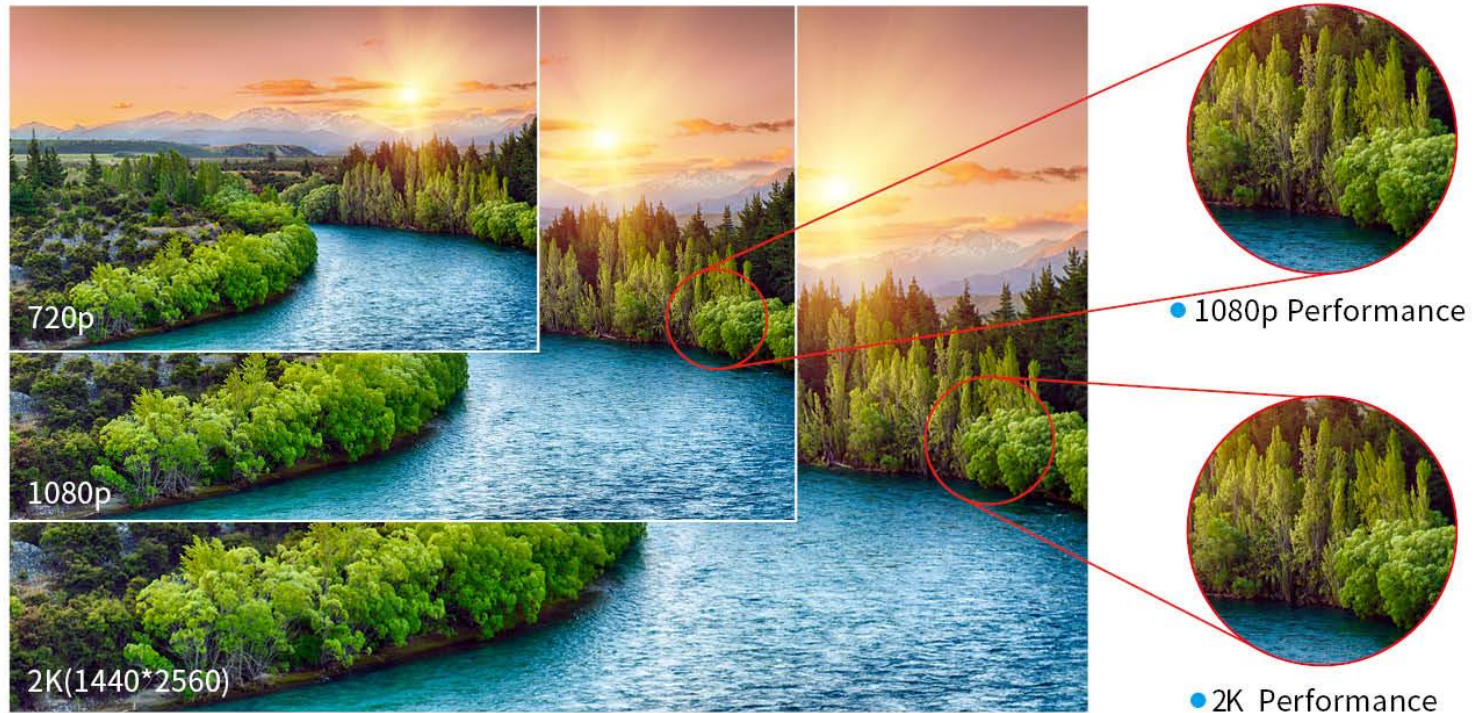
Simple Design	ITEM	FIC	Hybrid
	FPC	1	2
	FPC connector	1	2

02 Mobile Terminal | High NTSC Display Technology

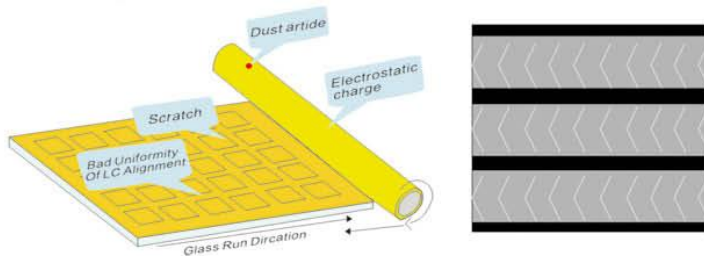
- **High NTSC Display Technology:** By improving color filter design and optimize backlight design, display modules achieve better color performance. NTSC reaches nearly 100%(CIE1931).
- **Product Advantages:** High NTSC display technology can display 15%-20% more color gamut than that of normal display, which can improve color performance and product experience greatly.



- **Product Advantages:** Take the product of 5.5' for example, compared with 1080P(404 ppi), 2K display (538 ppi) can provide much more image details, which can bring marvelous display performance.
- Truly has mass produced 5.5 and 6.0 inch 2K product .



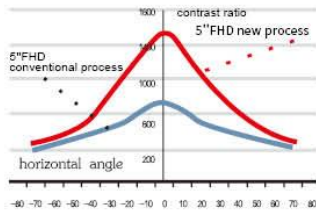
Rubbing



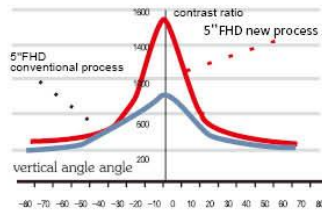
● Conventional Process:PI Rubbing

PI Rubbing process has limitations in providing uniform PI layer, which will finally affect the liquid crystal orientation, that's why PI rubbing process TFT panel has Mura issue and the contrast ratio is also affected.

● NLC + UV enhances display performance

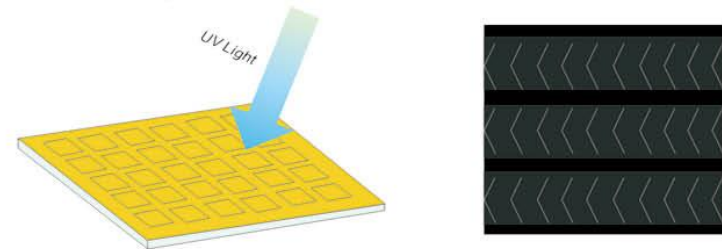


Changes of horizontal angle's contrast



The change of vertical angle of view

Photo-Alignment

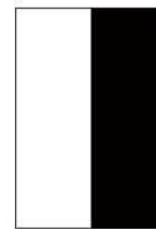


● New Process: UV Photo Alignment

UV Photo alignment is chemical process, which means it can provide more uniform PI layer and more precise liquid crystal orientation, that's why UV photo alignment can achieve higher contrast ratio and eliminate mura issue.

● NLC + UV enhances Contrast ratio , View Angle and Transmittance.

Higher Contrast Ratio



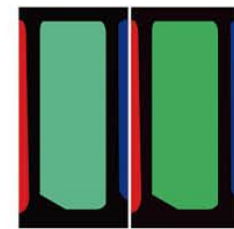
1000 → 1500

Wider View Angle



50° → 80° Angle

Higher Transmittance



100% → 115%

- Flexible display will be the mainstream display technology for the next generation of smartphone and wearable devices with huge market prospect
- Truly has developed AMOLED display and flexible display technology, and mass production in Q3 of 2016



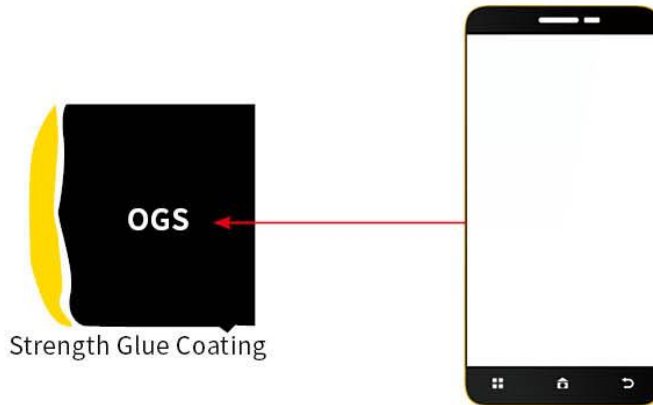
curved-screen phone



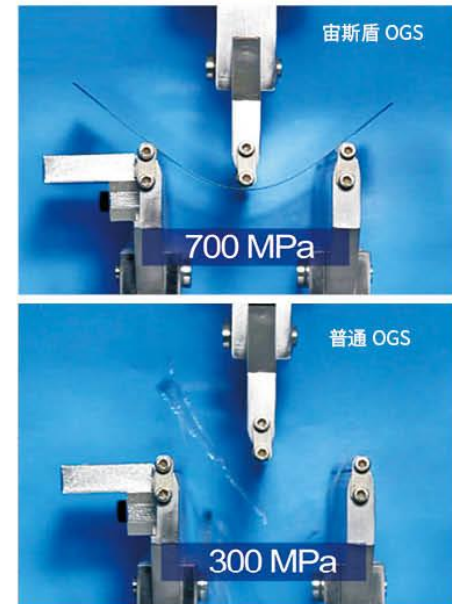
curved-screen watch



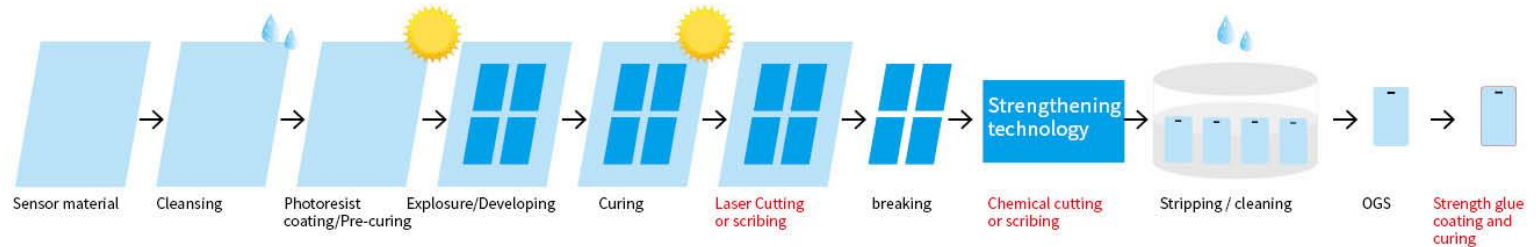
- **Technology Principle:** Enhance the strength and reduce the damage to the edge of the OGS glass by laser cutting, chemical cutting and strength glue coating.
- **Product Advantages:** Testing strength 700MPa is beyond the level of the peers'. By attaching the special glue around the OGS bezel can well protect the bezel of mobile phones' screen and prolong the service life.



● 700MPa Strength & Strength Glue Coating



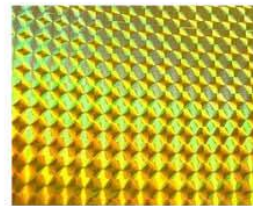
- AEGIS OGS achieves higher strength and shock resistance via special technology.



- Colorized CTP can meet customers' needs in personalization and differentiation.
- Colorized Film-CTP has been in mass production.



- New decorative thin-film process makes the color more bright. EF sheet can be designed as varied colors & metal luster according to customization.
- **Product Advantages:**
 - By adopting this special processing technology, there will be no segment differences on the edge and also realizing narrow-bezel at minimum 45um without light leakage.
 - Support 2.5D & flexible solutions
 - This method does not need multi-layer ink printing , which can simplify process and raise the yield rate.



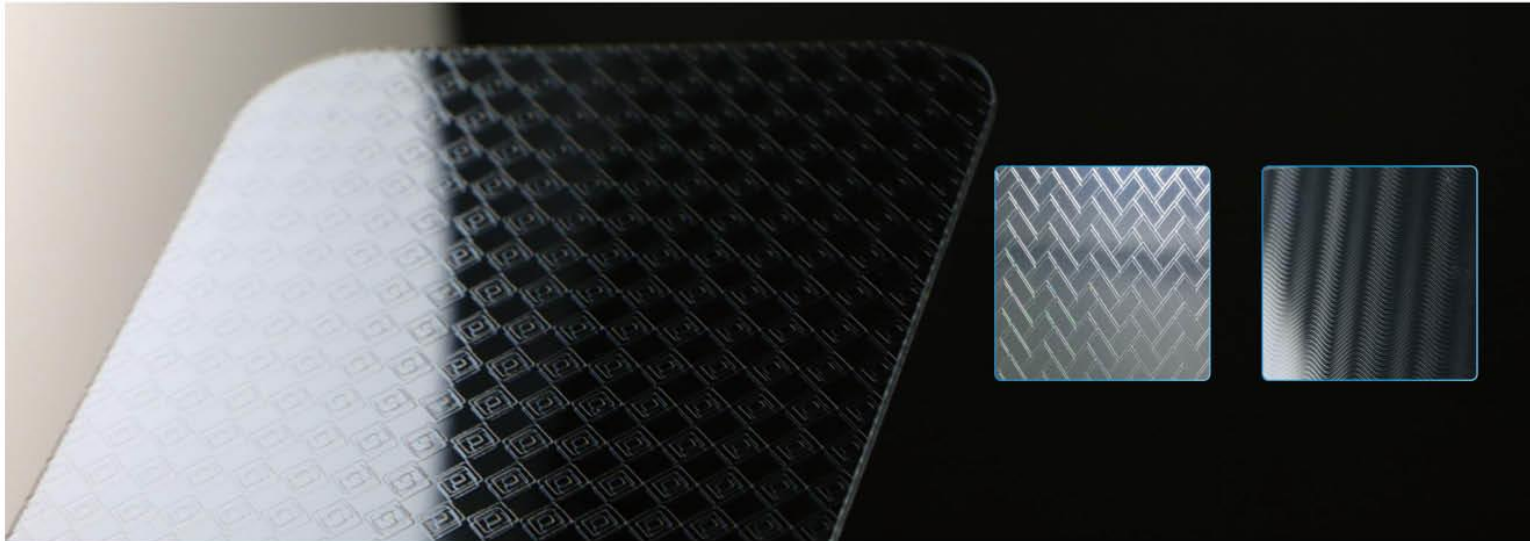
Metal luster



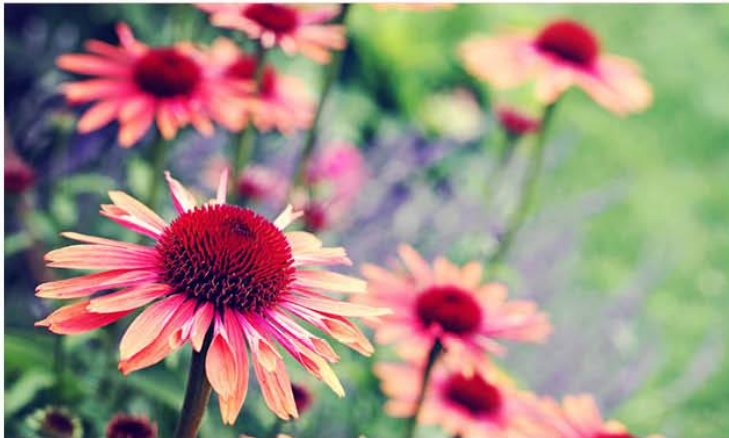
Color gradient & Colorful

- It can achieve every color in PANTONE Color. Moreover, supporting delicate and tiny geometric pattern as well as the design of holographic laser projection.

- **Patterned Glass Shell Technology:** Etching patterned glass adopts the latest technology of surface texture molding, so that the colors and patterns can be customized according to the demands of customers.
- **Technical Merit :** Pattern Line width / Spacing: 60um/90um(min)
- **Product Advantages:** ● stereoeffect ● personalized custom design ● better touch feel ● integration effect



- **Operating Principle:** When shooting with jitter, the vibrated information of camera will be converted into electrical signals by gyroscope and sent to OIS control driver, OIS control driver drives the motor to control the movement of lens in order to compensate the effects of jitter. Hall Sensor feeds back the position information of lens to OIS control driver. Therefore, it generates close-loop control to maintain the stabilization and definition of image.
- **Solutions:** 13\16\21\24MP OIS Camera Module
- **Product Advantages:** Adopting the latest auto-alignment equipments to produce and auto & all-direction equipments of OIS to test, which contributes to higher yield, higher efficiency and lower production cost.
- **Production Process:**

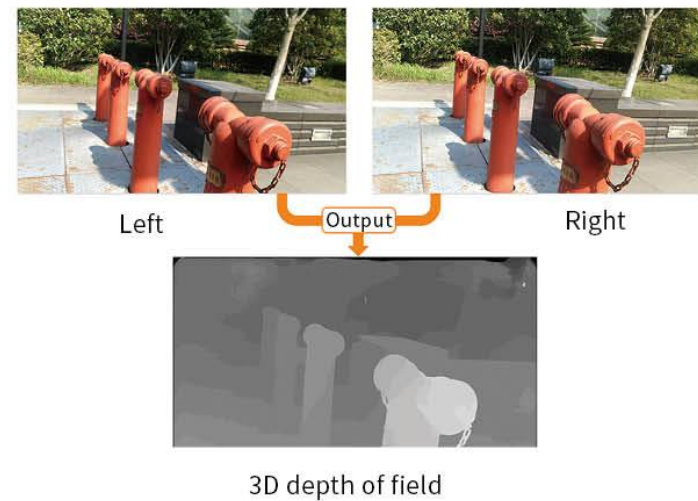
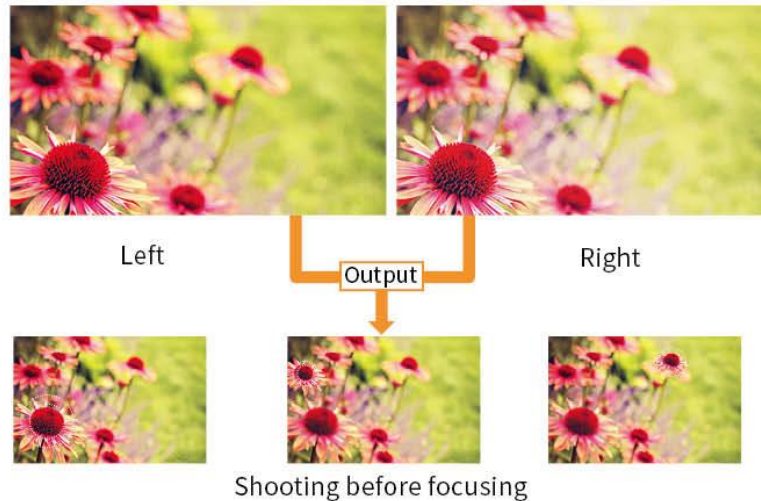


OIS ON



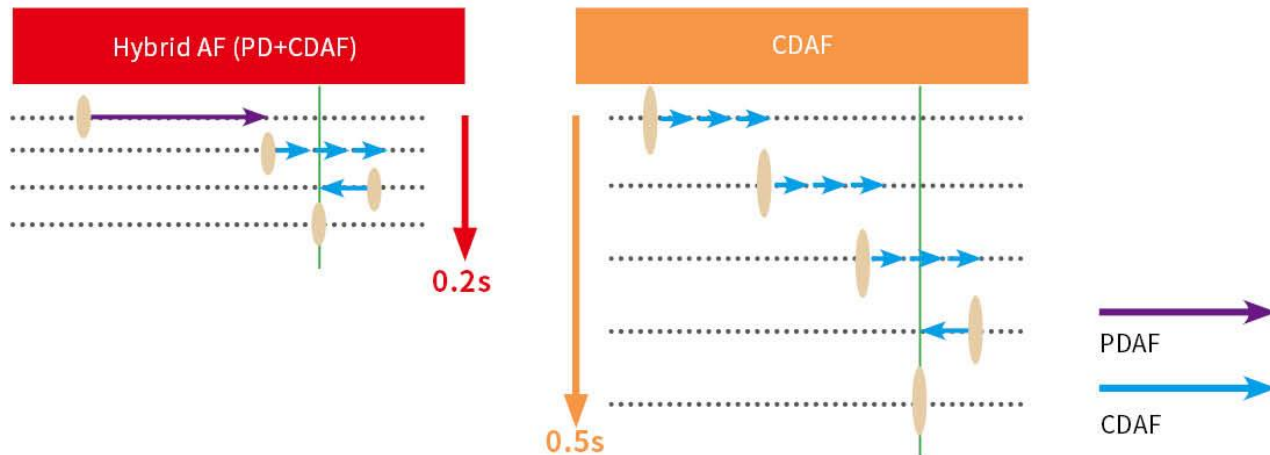
OIS OFF

- **Solutions:** 8+8MP\8+13MP\13+13MP Combined Module
- **Product Advantages:**
 - Equipped with specified ZeroTilt Middle-Mount VCM make dual cameras' two axes paralleled and products highly consistent.
 - Adopting advanced automatic calibration equipment to improved product yield and efficiency.
 - Provide software and hardware services, smartphone customers can use all functions without debugging.
- **Benefits of dual-camera module:**
 - By optical zoom to magnify objects and by the two independent sensors to enhance picture quality in low light environments, and it also can achieve various effects: 3D, ranging, modeling, gesture control, aperture adjustable, fast focusing and Bokeh etc.



- **PDAF Camera Module:** Calculating the distance of the object by image sensor detecting the imaging distance of lights from two directions, and Driver IC drives the motor to realize quick focusing.
- **Solutions:** 8\13\16\21\24MP Camera Module
- **Product Advantages**
 - Equipped with specified Zero Tilt Middle-Mount VCM makes the optical flat of lens paralleled with sensor's and figures out the fuzzy problems from four corners of large aperture and high resolution PDAF camera enhancing product's highly consistency.
 - Adopting independent automatic calibration equipment to improved products' yield and efficiency.

The Focusing Speed Comparison between PDAF & Contrast Detection AF (CDAF)



- With PDAF function, Lens can 80~90% close to the position of the focused point, and then reach the clear point with few contrast AF step, which is greatly quicker than conventional AF.

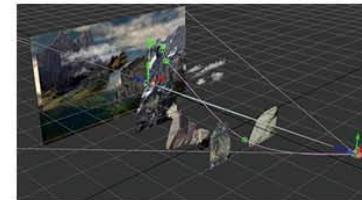
- **Operating Principle:** Each small lens captures images alone and then images are merged into a completed picture by a software platform.
- **Solutions:**
 - 2*2 Array 8MP Module & 4*4 Array 13MP Module
- **Product Advantages:**
 - Adopting the latest auto-alignment equipments to produce and advanced lens to align precisely contributing to high yield rate;
 - Mobile solution: Truly module has been authenticated by the mobile platform of MTK & Qualcomm, so the customers can use it directly with few software debugging.
 - Non-mobile phone Solution: Truly provides the combination solution of module + algorithm to achieve varied experiences, such as 3D effects, ranging, gesture control, shooting before focusing etc.



3D modeling



Gesture control



Location Modeling



Distant shot



Medium shot



Close shot

Output
→



Shooting before focusing

02 Mobile Terminal | Zero Black Bezel Lamination

- Truly with its oversea equipment supplier managed to develop one set of full lamination equipment, which can achieve zero bezel design
- **Technical Advantages :** ● High precise Alignment($\pm 5\mu\text{m}$) ● Full auto lamination ● High yield ● Bubble-free
- Integrated effect enhances the visual experience



- **Operating Principle:** Capturing from the related image region after Iris Identification Camera detecting the eyeball, and then gaining iris information to compare with original information to identify iris.
- **Solutions:** Two million pixel fixed focus + LED, support the recognition in dark light.

● Compared with other company' s modules

Item		Truly	Others	Conclusion
Farthest recognition distance (unit:cm)	Naked eye	40	≤ 30	No oppressive feeling when using 5'-15.6'screen terminals to Iris Identify at 35-40cm distance
	Bespectaced	35	≤ 25	
Recognition time		≤ 1s	≥ 2s	Our product recognize faster.
Opening eyes when recognition (the smaller, the more easily to identify)		35%	45%	Our products are more suitable for small eyes' users

● Application fields



Mobile security



Automotive security



Office security



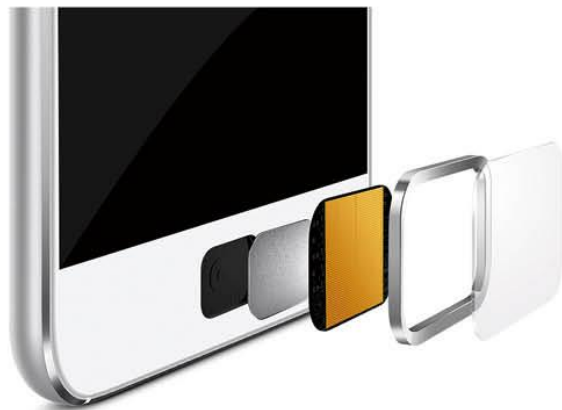
Access control systems



Automatic teller machine

02 Mobile Terminal | Fingerprint Identification

- Truly has developed FPI that has already been in mass production.



High surface hardness(6-7/9)
(sapphire and tempered glass)

Ultra-thin design(advanced glass
thickness reduction process)

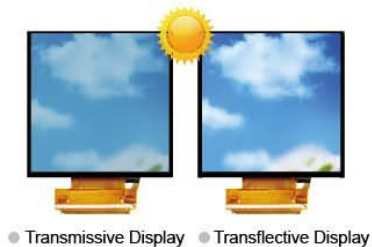
Integrated color design(match with
touch lens very well)

Convenient user experience
based on high sensitivity

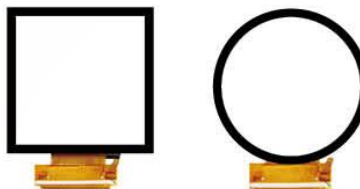




● Transflective Displays(Visible outdoor) ● Ultra-thin & Narrow-bezel ● Ultra-thin Display Module



● Transmissive Display ● Transflective Display



● GF(single point + gesture)
● CELL/SHEET OGS(single point + gesture/multi-points)
● Sapphire Glass



● By thinning glass, modules can reach<1.5mm thickness.

03 Automotive Applications





03 Automotive Applications | Integrated Display for Dashboard


- 12.3" Standard Integrated Display for Dashboard



Item	Contents
LCD type	IPS, a-Si, Normally Black, Transmissive
Screen Size	12.3 inch
Module area (W × H)	308.00 × 130.00 mm ²
Viewing area (W × H)	295.00 × 112.50 mm ²
Active area (W × H)	292.032 × 109.512 mm ²
Resolution	1920(W) × RGB × 720(H)
Operation temperature	-30°C to 85°C
Storage temperature	-40°C to 90°C
Surface treatment	Anti-glare (AG)
Contrast ratio	1000(Typ.)
Surface luminance	900 cd/m ² (Typ.)

- HUD system can reflect the information (such as navigation and speed) in front of windshield, so the drive can less-frequently head down to look at the dashboard or center control display, which will be more convenient and enhance the driving safety .

● Type 1 : TFT-LCD Based



● TFT-LCD Specs

1.8' TFT-LCD	480*240RGB,
Transmission: 5%	Contrast ratio: typ. 800

● Features

Image size	12 inches
Image distance	2.5 m
FOV	~ 8° * 4°
Volume	~ 16*14*6.5 cm ³
Image contrast	500
Image brightness	~6000 cd/m ²
Most cost-effective way	

● Type 2 : LCOS (Liquid Crystal on Silicon)



● Advantages

Higher resolution	Smaller size	Higher light efficiency
-------------------	--------------	-------------------------

● Features

Resolution	1280*720
Imaging size	~ 14 inches
Image distance	~ 2.5 m
FOV	8° * 3°
Small volume	~ 18*18*4.4 cm ³
Image contrast	300 ~ 500
Imaging brightness	10000 cd/m ²
Sunlight readable	
Easy installment & Customized as demands	

03 Automotive Applications | Smart Rearview Mirror

- The Smart Rearview Mirror is that integrating a touch screen device into a mirror to display the necessary information of the road and other data, which is less distracting than your dashboard or elsewhere, because it is a place you're already used to glancing at regularly.
- Providing clear rearward visibility unimpeded by traditional obstacles such as cargo, tall passengers, inclement weather or the design of a vehicle.



● Partial Display

It is wider than your typical rear view mirror, and the touch screen component only takes up part of the display. When powered down, it is apparently reflective like the rest of the mirror. The smart rear view mirror is designed to be used for navigation, in-car music and even as a digital assistant.



● Full Display

It is a rearview mirror with a built-in full-size LCD monitor displaying images from a camera mounted on the rear of the vehicle. This mirror allows the driver to switch between the LCD monitor and the standard rearview mirror, depending on the driver's preference.

● The world's first Optical Bonding Smart Rearview Mirror !

Truly provides Optical Bonding modules which means the TP attached to LCM with OCA or Liquid OCA to make display less-reflection and more clear.



- Auto-dimming mirrors make nighttime driving safer by detecting glare from the vehicles behind and automatically dimming to protect driver vision.
- Auto-dimming by reversing liquid crystal eliminates the temporary blind spot caused by the Troxler effect after the glare source leaving the field of view.
- This technology has been patented successfully and the product was in mass production.

Troxler Effect

Average Braking distance at 100KMS

42meters(with auto dimming function)



81meters(without auto dimming function)



Remark : Troxler Effect makes the driver delay at least 1.4 seconds to react affected by glare than in peacetime.



Conventional Rearview Mirror



Auto-dimming Rearview Mirror



03 Automotive Applications | TP Surface Micro-nano Treatment

- Truly has organized a team to develop the glass surface treatment technology including AG/AR treatment. With this technology and production line, Truly can make the surface treatment in-house and provide a CTP with a excellent optical performance to meet the requirement of automotive applications.

AF treatment (Anti-fingerprint)



- Water contact angle $\geq 110^\circ$

AR treatment (Anti-reflection)



- Low reflectance. Average 1% in the visual spectrum

AG treatment (Anti-glare)

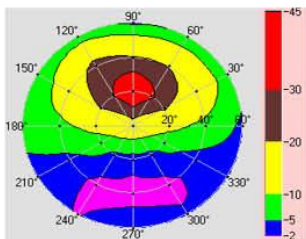


- Etching process to realize lifetime touch endurance.
- Wide haze range from 2% to 25%

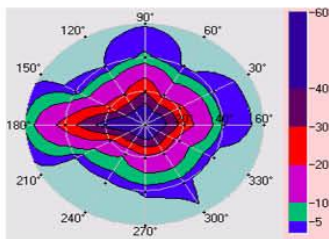
- TBN can achieve higher contrast and wider viewing angle
- Without light leak issues, suitable for varied color backlight
- This product has been in mass production.



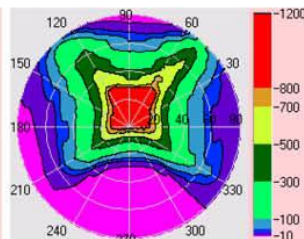
High conerast



TN

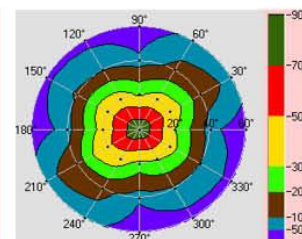


DSTN



TBN

wide viewing angle

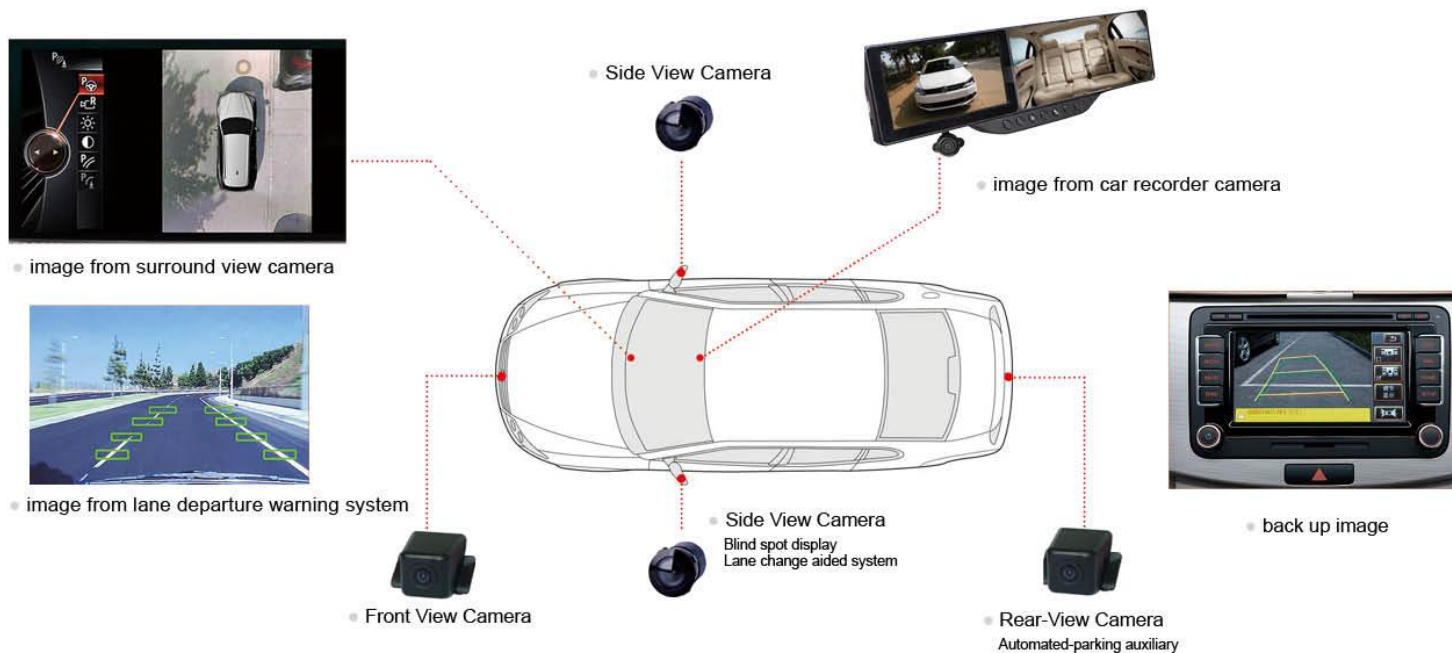


TFT panel with polarizer

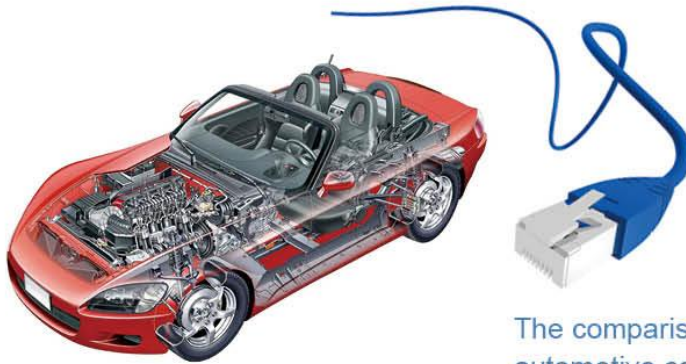
CR	>50
U	45
D	45
L	50
R	50

03 Automotive Applications | Automotive Cameras

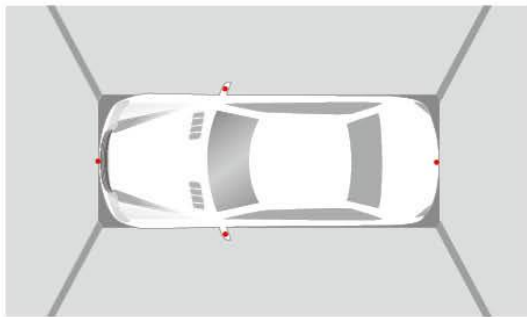
- High reliable, High frame rate, Multi-functional wireless, Ethernet interface
- The advantages of Truly automotive camera:
 - Complete camera types: lane departure warning, surround view, rearview, night view, driving recorder cameras.
 - Product Specification: Products are made of automotive-class material.
 - Reliable products: Adopting foreign advanced reliability test equipment and certification.



- Ethernet interface, as a transmission path, is applied to automotive related products. Under the condition of maintaining low EMI, adopting low-cost single-pair unshielded twisted pair can satisfy the requirement of high resolution, higher antijamming capability and huge amount of information. Meantime, integrated easily with consumer electronics, it is the best solution for automotive high bandwidth bus.



The comparison between Ethernet and LVDS interface automotive camera technologies:



Product Interface	ethernet	LVDS
Comparison item		
Resolution	High	High
antijamming capability	Strong	Weak
teansmission bandwidth	≥ 100Mbps	1Gbps
cable cost	Low(single-pair unshielded twisted pair)	high(needing shielded twisted pair, connector costs high too)

04

Internet of
Thing(IOT)
Applications



- **Customization:** Accepting customers' customization and providing complete solution of IOT components
- **Solutions:** Display, Touch Panel, Full Lamination, Camera, FPI and Integrated Control Modules.
- **Truly advantages:**
 - Supplying one-stop service and reducing the cost of customer's management and transportation.
 - Project team has own professional field and has cooperated with international customers for more than ten years, familiarised with all kinds of terminal's datas.
 - Having various LCD, TP and advanced abnormality cutting technology.
 - More automated product line, more strict management and higher product yield.



04 IOT Application | Free Viewing Angle Mono TFT Display

● Product Advantages:

- Wide view angle, high transmittance, high contrast, black bottom color and low cost

● Application Fields:

- Smart household, such as air conditioners, refrigerators, washing machines, microwave ovens etc.
- Medical Electronics, such as hematomanometer, blood glucose meter etc.
- Office Devices, such as Printers, photocopiers, IP phone etc.
- Automotive instrument, industrial control and wearable devices.



Wide View Angle

Low Cost



High Transmittance

High Contrast and Black Bottom

Item	Normal-white MONO TFT	Normal-black MONO TFT
Transmittance	Good	Good
Outdoor Performance	Normal	Normal
Viewing angle	Poor	Good
Background color	Grey	Black
Contrast ratio	Good	Good
Response time	Good	Good
Power consumption	Good	Good
Cost	Good	Normal

● Product Advantages:

- By reflecting ambient light, Transflective TFT can display images without backlight turning on, which can be widely used on outdoor applications, such as GPS, Smart watch and Interphone. Thus saving power consumption greatly.

● Truly Advantages:

- Truly has devoted to TFT production for industrial and automotive applications line and becomes one of the few manufacturer researching and producing transflective TFT. Truly roundness or square transflective TFT display products can be fully customized and supplied in long term.

- Outdoor display performance based on transmissive TFT



- Outdoor display performance based on transflective TFT is better



04 IOT Application | Smart Key Display Technology

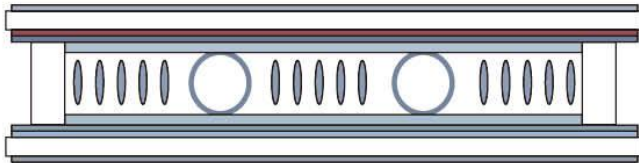
● Working Principle

- By integrating the touch sensor into LCD to realize embedded touch function.

● Application Fields

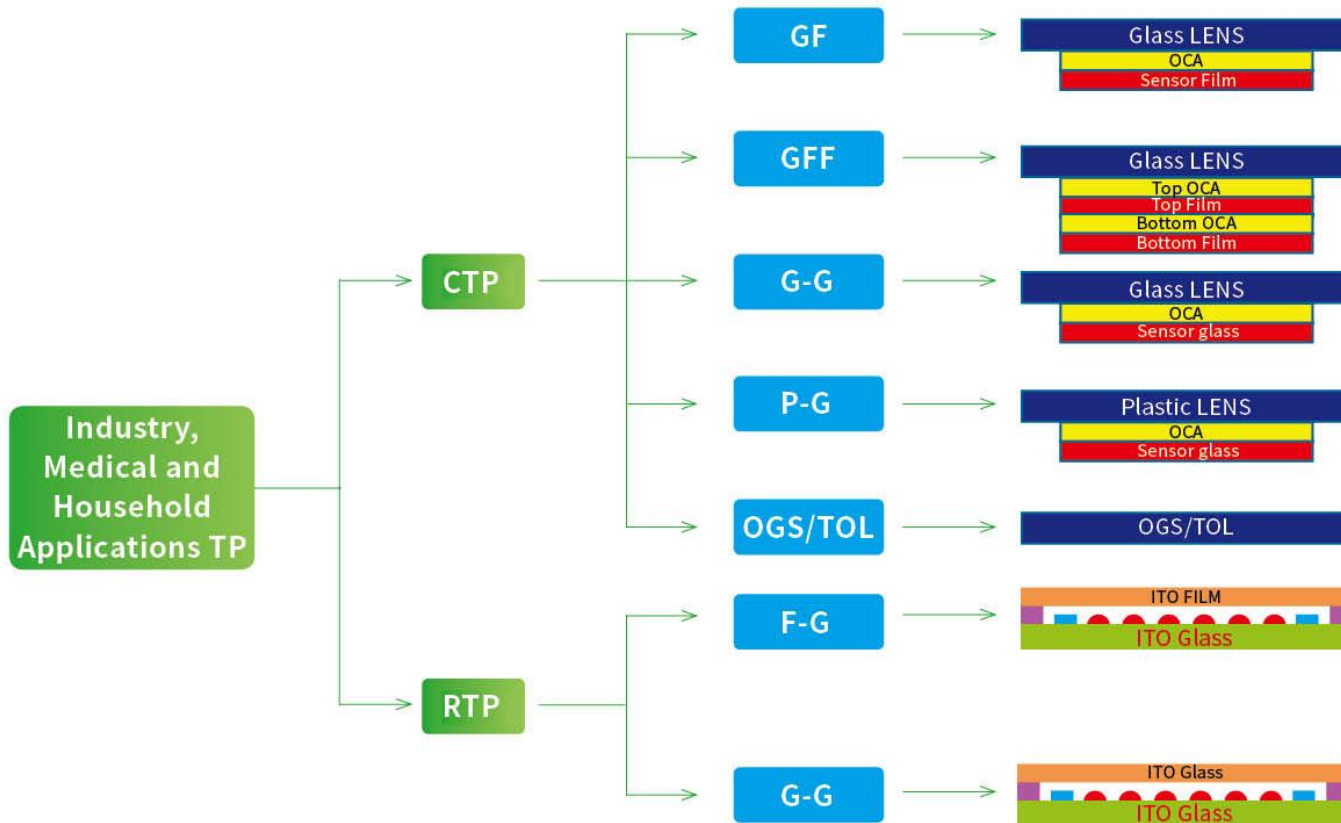
- Smart household, such as air conditioners, refrigerators, washing machines, microwave ovens etc.
- Medical Electronics, such as hematomanometer, blood glucose meter etc.
- Office Devices, such as printers, photocopiers, IP phone etc.
- Automotive instrument and industrial control

SKD Structure



Items	Mechanical key	Outboard RTP	Outboard CTP	Smart Key Display
Life Span	With in 3 years	3 years	Over 5 years	Over 5 years
Dust-proof Ability	Weak	Strong	Strong	Strong
Water-proof Ability	Weak	Strong	Strong	Strong
Sensitivity	Poor	Poor	Better	Good
Produat Strudure	Complicated	Compact	Compact	Compacter
Product Thickness	Thicker	Thick	Thick	Thin
Cost Comparisons	●	●●●	●●●●	●●





04 IOT Application | Solutions of Differentiated Cameras



● Truly Advantages:

- Most complete one-stop solution manufacturer: supplying OS+ PCB+LCD+TP.
- Sufficient Capacity: TFT and AMOLED capacity can meet the demands of household applications and other industrial products.
- Varied Products: providing the latest structure of LCD,TP and camera for special appliances .
- All-round Support: Truly has cooperated with international customers for more than ten years and has the dedicated development team and sales team, so Truly can provide customers with full ranges of business services from product definition to after-sales service.



Project Comparison	TRULY	Other company
system startup	≤ 10S	≥ 15S
flash	Yes	None
operating speed	Fluent, Close to the android mobile phone	Stuck seriously
UI customization	Yes	No



● Smart Monitoring Camera ● Smart Refrigerator ● Smart Air-condition ● Smart Washin Machine ● Smart TV



● Providing security assurance for home and office in dark environment.



● Touch and LCD screen: better human-computer interaction.
Camera: recording food information and uploads it to the cloud to remind users to address food issues.



● Adjust wind direction and temperature by camera detecting the number of people, body temperature and distance between people and air conditioning.



● Integrated control system of home appliances with image guidelines, runs smoother and operate simpler.



● Dual camera can detect small changes in body posture within 10 meters, so it can provide accurate data changes for variety of interactive games and applications.



- Auto-darkening welding helmet
- Detecting camera for tunnels and sewers
- Logistics handset



● Optical performance is superior because of characteristics of two-piece LCD light valve structure and autonomous optical bonding patent technology, and this product has passed the European CE certification and the United States ANSI standard, more safety than ordinary.



● Upload the data, which record by camera in the tunnels and sewers inspection device, to the cloud, and Truly product has high reliability with better low light performance, waterproof and high temperature resistance.



● Truly supply professional handheld touch display module and camera module. Making the products have higher quality and more intelligent.



- Smart Medical Devices
- Portable Transfer monitoring Device
- Organ Speculum
- Medical Staff Handset



● Truly provide high sensitivity and reliability touch display module. the response time is faster.



● Device with 5~7" touch display module, can detect the ambient light to adjust the screen brightness automatically.



● Camera of high resolution and high frame rate can supply safe and reliable information for various organs detected.



● Handset with integrated touch control module and camera improve the efficiency of workers and make it easier to save the patient information.



- Smart Copier
- Professional Handset
- Smart High-speed Scanner
- Video Phone
- Smart Pen



● Adopting 10.1" HD touch integration module make operation more fluently and working smarter.



● Handset with integrated touch control module and OIS camera module make outdoor work smarter.



● Products with large apertures and high-megapixel camera module make the accreditation process smoother.



● Video phone adopt HD display module and high frame rate camera module, making the communication more easily and real.



● Smart pen with small wide angle low-power OLED display module is more convenient to use all of its functions.

04 IOT Application | Core Components Solutions of UAV

- **Main Camera :**

Adopting 13MP+ Camera supporting 4K2K@30fps+ Imaging sensor with three cameras can shoot 360 degrees edge distortion-free imaging, human motion tracking and 3D applications such as air modeling.

- **Obstacle Recognition Camera :**

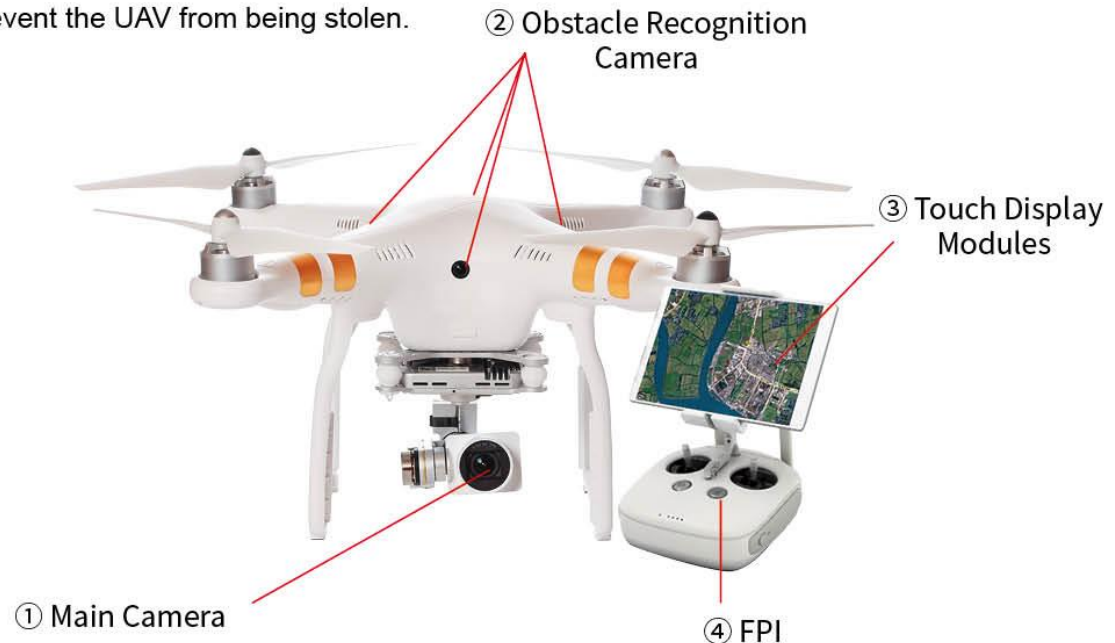
There are some cameras in UAV, they can recognize the obstacle quickly and remind the operator to avoid crash or impact.

- **Touch Display Modules :**

Providing LCD, TP and Full Lamination products of 0.1~15.6 inches.

- **FPI :**

Recognize operators and Prevent the UAV from being stolen.



● Main Camera :

Adopting 13MP+ Camera supporting 4K2K@30fps+ Imaging sensor with dual cameras can support 180 degrees video shooting, body detection, ranging, motion detection, face detection, gesture detection and food detection.

● Obstacle Recognition Camera :

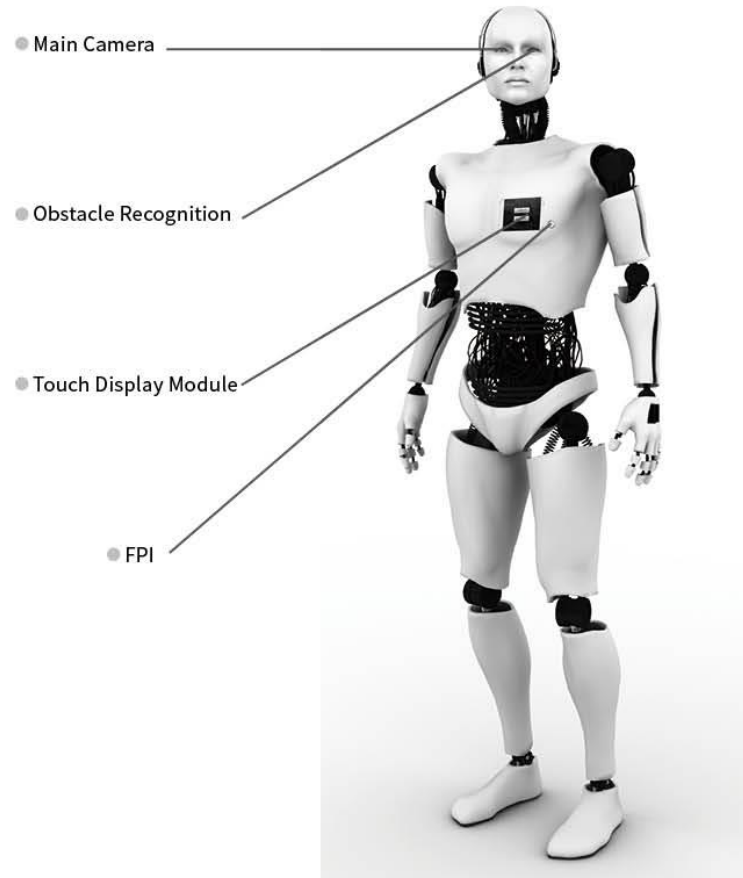
Recognize the obstacle quickly and remind the operator to avoid crash or impact.

● Touch Display Module :

Providing LCD, TP and Full Lamination products of 0.1~15.6 inches.

● FPI :

Recognize operators and prevent the Robot from being stolen.





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