

# Specification for Approval

Customer: \_\_\_\_\_

Model Name: \_\_\_\_\_

Supplier Approval			Customer approval
R&D Designed	R&D Approved	QC Approved	
<i>Peter</i>	<i>Peng Jun</i>		



### Document Revision History

Version	Date	Page	Description	Changed By
V0	2019-08-08	ALL	First issue	

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## 1. LCM Specification

### 1.1 Description

**AM-7201280-050E** is a transmissive type color active matrix liquid crystal display(LCD) which uses amorphous thin film transistor(TFT) as switching devices. This product is composed of a TFT LCD panel , a drive IC, a FPC , a LED-backlight unit. The active display area is 5.0 inches diagonally measured and the native resolution is 720\*RGB\*1280.Features of this product are listed in the following table.

### 1.2 Functions & Features

**Table 1.1 Module Functions & Features**

Parameter	Value	Unit
LCD Mode	TFT/Transmissive	-
Color Depth	16.7M	-
Display Resolution	720RGB*1280	pixels
Module Size	119.3(H)*65.3(W)*1.61±0.1 (T)	mm
Active Area (A.A)	110.40(H)*62.10(W)	mm
Pixel Arrangement	RGB-vertical stripe	-
Viewing Direction	ALL O' CLOCK	
Display Mode	Normally Black	
LCD Controller/Driver	ILI9881D	-
IC Package Type	COG	-
Interface	MIPI Interface	-
Power Supply Voltage	2.8~3.3	V
Back-light	White LED*12	PCS

## 2. Mechanical Specification

1. LED类型: 4.97" TFT  
 2. 分辨率 (Resolution): 720P@60Hz DOTS  
 3. 显示色彩 (Color): 16.7M  
 4. 驱动IC (Driver IC): IL19881D  
 5. 视角 (Viewing Angle): ALL  $\theta$  CLOCK  
 6. 背光类型 (Backlight Type): 12颗正白/侧偏 LED  
 7. 背光亮度 (Backlight Type): 12颗正白/侧偏 LED  
 8. 接口类型 (Interface Type): MIPI  
 9. 工作电压: VCC: 2.8V, DVCC: 1.8V  
 10. 操作温度 (Operating Temperature):  $-20^{\circ}\text{C} \sim +70^{\circ}\text{C}$   
 11. 储存温度 (Storage Temperature):  $-30^{\circ}\text{C} \sim +80^{\circ}\text{C}$   
 12. 未注公差:  $\pm 0.2\text{mm}$   
 13. 所有物料符合RoHS标准 (All materials comply with RoHS standard).  
 建议客户对外观区域按比例放大显示区域(A:放大0.3mm).

**产品特性 (Features):**  
 1. LED类型: 4.97" TFT  
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**LED CIRCUIT DIAGRAM**  
 背光电路: V=17, I=19.2V, IF=40MA

**PFC弯折示意图**  
 产品弯折出货

30	GN0
29	D2+
28	D2+
27	GN0
26	D0+
25	D0+
24	GN0
23	GN0
22	GN0
21	GN0
20	D1+
19	D1+
18	GN0
17	D2+
16	D2+
15	CTP_A0G
14	CTP_S0A
13	CTP_S0A
12	CTP_A1N
11	CTP_A1N
10	GN0
9	LOW_IE
8	LOW_AST
7	GN0
6	LEDK
5	LEDK
4	LEDN
3	LEDN
2	LOWVC
1	VCC

**尺寸定义**  
 6 CTP\_V0G  
 5 CTP\_S0A  
 4 CTP\_S0A  
 3 CTP\_INT  
 2 CTP\_A1N  
 1 GN0

REV.	DESCRIPTION OF REVISION	REASON	REVISED BY	DATE
1	first issue	A	XG_SU	2019/08/08

于都上晴电子有限公司  
 YU DU AMSON ELECTRONICS Co., Ltd.

TITLE: OUTLINE DIMENSION	D/N: AMT201280-050E	UNITS: mm
DRAWN BY:	Rev: A	
CHECKED BY:		
APPROVED BY:	SCALE: 1:1	SHEET NO: 1 OF 1

## 3.Pin Descriptions

Pin No.	Symbol	Functional
1	VCI (2.8V)	Power supply to the analog circuit 2.8-3.2V
2	IOVCC(1.8V)	Power supply to the analog circuit 1.8-3.2V
3	LED_A	LED_A
4	LED_A	LED_A
5	LED_K	LED_K
6	LED_K	LED_K
7	GND	Power Ground
8	RST	RST
9	TE	TE
10	GND	Power Ground
11	TP_RST	TP_RST
12	TP_INT	TP_INT
13	I2C_SCL	I2C_SCL
14	I2C_SDA	I2C_SDA
15	TP_VCC	TP_IOVCC 2.85V
16	MDSI_A_D2_DP	Data pairs
17	MDSI_A_D2_DN	Data pairs
18	GND	Power Ground
19	MDSI_A_D1_DP	Data pairs
20	MDSI_A_D1_DN	Data pairs
21	GND	Power Ground
22	MDSI_A_CLKP	MIPI DSI differential clock pair (DSI-CLK+/-)
23	MDSI_A_CLKN	Data pairs
24	GND	Power Ground
25	MDSI_A_D0_DP	Data pairs
26	MDSI_A_D0_DN	
27	GND	Power Ground
28	MDSI_A_D3_DP	Data pairs
29	MDSI_A_D3_DN	Data pairs
30	GND	Power Ground

## 4.Electrical Units

### 4.1 Absolute Maximum Ratings

The absolute maximum ratings are list on Table 4.1. When used out of the absolute maximum ratings, the LCM may be permanently damaged. Using the LCM within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are exceeded during normal operation, the LCM will malfunction and cause poor reliability.

**Table 4.1 Module Absolute Maximum Ratings**

Parameter	Symbol	Condition	Ratings		Unit	Remark
			Min.	Max.		
Driver IC(Positive Analog) Power Supply Voltage	VSP-AVSS	Ta=+25°C	4.5	+6.3	V	[Note 1]
Driver IC(Negative Analog) Power Supply Voltage	AVSS-VSN	Ta=+25°C	-6.3	-4.5	V	[Note 1]
Driver IC(Digital) Power Supply Voltage	VDDI-GND	Ta=+25°C	-0.3	+3.6	V	[Note 1]

[Note1] Voltage applied to GND pins. GND pin conditions are based on all the same voltage (0V). Always connect all GND externally and use at the same voltage.

## 4.2 Electrical characteristics (Ta=25°C)

**Table 4.2:DC Characteristic (Vcc = 2.3 ~ 3.3V)**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Gate High voltage	VGHO	-	12.0	-	V	[Note 2]
Gate Low voltage	VGLO	-	-12.0	-	V	[Note 2]
Source High voltage	GVDDP	-	4	-	V	[Note 2]
Source High voltage	GVDDN	-	4	-	V	[Note 2]
Common Electrode Driving voltage	VCOM	-	-0.29	-	V	VCOM=0.0-ΔVd(White)

## 4.3 LCM Specification

**Table 4.3 LCM Characteristics**

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	VF	Only Backlight	--	18.6	--	V
Supply Current	IF		40			mA
Average Brightness	IV	IF=40mA	--	450	--	Cd/m2
CIE Color Coordinate	X	IF=40mA (Without LCD)	0.25	-	0.31	-
	Y		0.25	-	0.31	
Uniformity	B	IF=40mA	80	-	-	%
Color	White					

## 5. AC Characteristics



## 5.1 AC Characteristics for High Speed Mode

(VSS=VSSI=DVSS=0V, VDDI=1.65V to 3.6V, VCI=2.5V to 4.8V, Ta = -30 to 70°C)

Signal	Symbol	Parameter	MIN	TYP	MAX	Unit	Description
DSI-CLK+/-	2xUIINST	Double UI instantaneous	2	-	5	ns	4 Lane [Note 2]
DSI-CLK+/-	UIINSTA UIINSTB	UI instantaneous halves (UI = UIINSTA = UIINSTB)	1	-	2.5	ns	4 Lane [Note 2]
DSI-Dn+/-	tDS	Data to clock setup time	0.15xUI	-	-	ps	
DSI-Dn+/-	tDH	Data to clock hold time	0.15xUI	-	-	ps	
DSI-CLK+/-	tDRTCLK	Differential rise time for clock	150	-	0.3xUI	ps	
DSI-Dn+/-	tDRTDATA	Differential rise time for data	150	-	0.3xUI	ps	
DSI-CLK+/-	tDFTCLK	Differential fall time for clock	150	-	0.3xUI	ps	
DSI-Dn+/-	tDFTDATA	Differential fall time for data	150	-	0.3xUI	ps	

## 5.3 AC Characteristics for Low Power Mode

(VSS=VSSI=DVSS=0V, VDDI=1.65V to 3.6V, VCI=2.5V to 4.8V, Ta = -30 to 70°C)

Signal	Symbol	Parameter	MIN	TYP	MAX	Unit	Description
DSI-D0+/-	TLPXM	Length of LP-00, LP-01, LP-10 or LP-11 periods MPU à Display Module	50	-	75	ns	Input
DSI-D0+/-	TLPXD	Length of LP-00, LP-01, LP-10 or LP-11 periods Display Module à MPU	50	-	75	ns	Output
DSI-D0+/-	TTA-SURED	Time-out before the MPU start driving	TLPXD	-	2xTLPXD	ns	Output
DSI-D0+/-	TTA-GETD	Time to drive LP-00 by display module	5xTLPXD	-	-	ns	Input
DSI-D0+/-	TTA-GOD	Time to drive LP-00 after turnaround request - MPU	4xTLPXD	-	-	ns	Output

## 6. Optical Specifications

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25°C. The values specified are at an approximate distance 50cm from the TFT-LCD surface at a viewing angle of  $\Phi$  and  $\theta$  equal to 0°.

Measurement condition: Refer to next pages ( C-light source, Halogen Lamp )

\*1): with Polarizer \*2): without Polarizer \*3): Only Color Filter glass

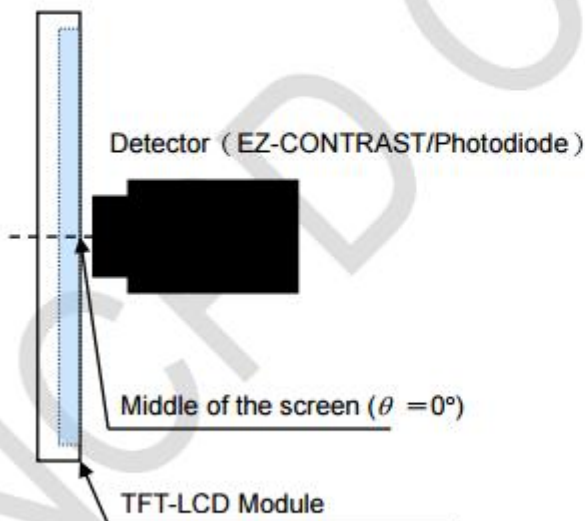


Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remark	
Viewing angle range	Horizontal	$\theta 21$	$CR \geq 10$		80	-	Deg.	Note1, 6	
		$\theta 22$			80	-			
	Vertical	$\theta 11$			80	-	Deg.		
		$\theta 12$			80	-			
Brightness		Br	$\theta = 0 \text{ deg.}$		450		cd/m <sup>2</sup>	Note1, 6	
Contrast ratio		CR		600	1000			Note2, 6	
Response time		Tr+tf		-	25	35			Note3, 6
Transmittance		Tf%		2.9	3.4				With APCF Note4, 5
Chromaticity of white		x		0.290	0.310	0.330			With C-light Note5
		y		0.314	0.334	0.354			
Chromaticity of red		x		0.641	0.661	0.681			
		y	0.306	0.326	0.346				
Chromaticity of green		x	0.257	0.277	0.297				
		y	0.550	0.570	0.590				
Chromaticity of blue		x	0.125	0.145	0.165				
		y	0.057	0.077	0.097				
Uniformity	%	-	-	80	-			Note7	
NTSC Ration	%	-		65	70	-		Note5	

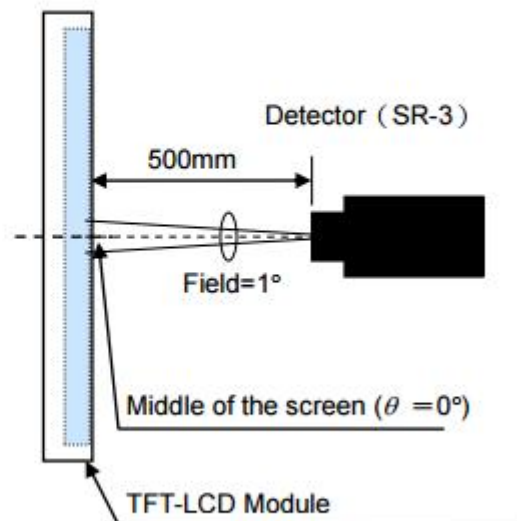
\*The measurement shall be executed after more than 5 minutes while backlight turning on.

\*These values are measured with NCPD standard back light unit.

\* The optical characteristics are measured using the following equipment.

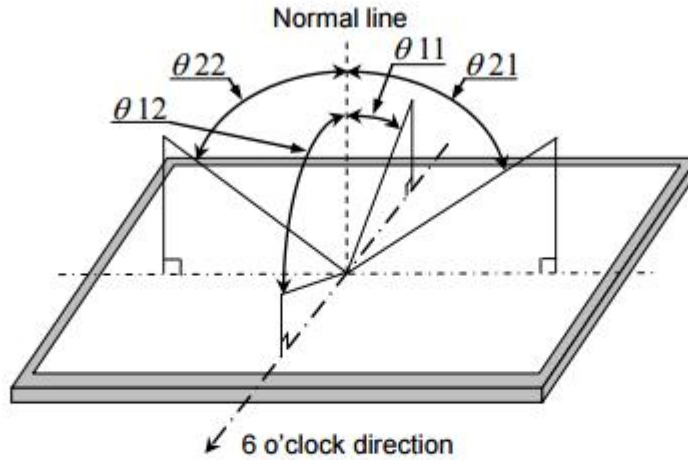


Measurement of viewing angle range, Response time.



Measurement of Contrast, Luminance, Chromaticity.

[Note 1] Definitions of viewing angle range:



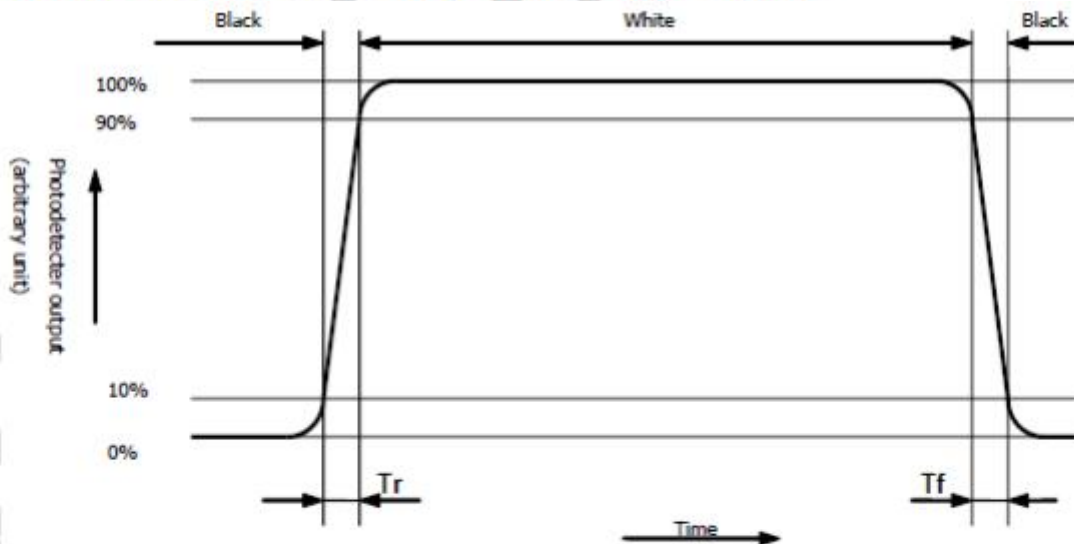
[Note 2] Definition of contrast ratio:

The contrast ratio is defined as the following.

$$\text{Contrast Ratio} = \frac{\text{Luminance (Brightness) with white screen}}{\text{Luminance (Brightness) with black screen}}$$

[Note 3] Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "Full Black" to "Full White" (rising time,  $T_r$ ), and from "Full White" to "Full Black" (falling time,  $T_f$ ), respectively. The response time is interval between the 10% and 90% (1 frame at 60 Hz) of amplitudes.



$$\text{Response time} = T_r + T_f$$

[Note 4] The spec in table is for reference, different LED spectrum would make different performance for it.

[Note 5] It is simulated with C-light source. Chromaticity coordinates will be changed by use different LEDs.

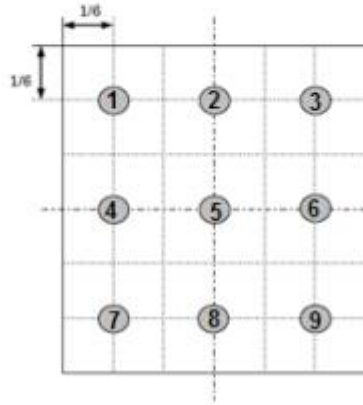
[Note 6] This shall be measured at center of the screen.

[Note 7] Definition of Luminance and Luminance uniformity:

Luminance: To measure at the center position "5" on the screen (NO.5).

Luminance uniformity: Lw (MAX) and Lw(MIN) are the maximum and minimum luminance value measure at the position "1~9" on the screen (NO.1~9) and the equation:

$$\Delta Lw = Lw(MIN) / Lw(MAX) \times 100\%$$



## 7. Reliability Test Item

NO	项目	样品数量	条件	实验内容	备注								
1	高温运行	5PCS	70±3℃ 48 小时	长时间处于高温通电状态	实验样品点亮								
2	高温存放	5PCS	80±3℃ 48 小时	长时间高温储存	实验样品不点亮								
3	低温运行	5PCS	-20±3℃ 48 小时	长时间处于高温通电状态	实验样品点亮								
4	低温存放	5PCS	-30±3℃ 48 小时	长时间高温储存	实验样品不点亮								
5	高温/高湿度存放	5PCS	60℃, 90%RH, 48 小时	长时间处于高温高湿度存储	实验样品不点亮								
6	高低温冲击实验	5PCS	-(10-30)℃ ↔ +(70-80)℃, 1H 转换, 24 周期	第循环由二个 min 和二个转换所需时间组成, 如此循环 30	试验样品不点亮, 实验后功能, 外观及检测应正常								
7	振动实验	5PCS	<table border="1"> <thead> <tr> <th>方向</th> <th>频率</th> <th>振幅</th> <th>时间</th> </tr> </thead> <tbody> <tr> <td>X&amp;Y</td> <td>25HZ</td> <td>2mm</td> <td>10min</td> </tr> </tbody> </table>	方向	频率	振幅	时间	X&Y	25HZ	2mm	10min	整个振动持续时间建议不超过 10min (时间为单个方向)	实验样品不点亮
方向	频率	振幅	时间										
X&Y	25HZ	2mm	10min										
8	ESD 测试	5PCS	1. 电压要求: 空气放电±8KV, 接触放电±6KV; 2. 放电方式: 连续单次放电, 每秒放电不超过一次, 连续放各放电 10 次	LCM&CTP 单体表面四角图示位置 	试验后样品各功能, 测试正常								
9	FPC 柔韧度测试	5PCS	测试速度 20~30 次/min(往复运动)	1. 线路阻值 (FPC 耐弯折性测试) 把 FPC 的导电端固定在导电夹上, 往复运动 8 次后量测 FPC 电	实验样品不点亮, 试验后样品各功能, 测试								

				阻值变化率小于 15% 2. 金手指外观 (FPC 端子部强度测试) 把 FPC 置于手动耐弯折测试议内, 弯折金手指以金手指的 2/3 处为轴, 成 180 角, R0.5mm 反复弯折三次后取出检查. 试验后弯折 3 个循环不断裂, 分层.	正常			
10	包装跌落实验	1 箱	1. 整箱按出货要求进行包装; 2. 一角, 三菱, 六面, 各二次	产品重量 (KG)	跌落高度 (自由落体)	试验完后包装外箱, 内盒不得出现严重破损, 变形或散乱, 内装样品功能, 外观及装配应正常.		
				<5	60 ± 5CM			
				5~10	50 ± 5CM			
				10~20	40 ± 5CM			
> 20	30 ± 5CM							
11	包装振动实验	1 箱	1. 整箱按出货要求进行包装; 2. 每个面朝下各试验 10min, 共 60min.	方向	频率	振幅	时间	试验完后包装外箱, 内盒不得出现严重破损, 变形或散乱, 内装样机功能, 外观及装配应正常.
				X&Y	25HZ	2mm	10min	
				时间为单个方向				

以上单屏试验项目, 可能会影响外观, 但显示性能应当是 OK 的。

## 8. Package(TBD)

## 9. Handling Precautions

### 9.1 Safety

The liquid crystal in the LCD is poisonous. Keep away from your mouth and eyes. If the liquid crystal contacts with your skin, mouse or clothes, use soap to wash it off immediately.

### 9.2 Handling

- i. The LCD panel is made by thin glass. Prevent the panel from mechanical shock or putting excessive force on its surface.
- ii. The polarizer attached on the display is very easy to be damaged, handle it with special attention.
- iii. To avoid contamination on the display surface, do not touch the display surface with bare hands.
- iv. The transparent electrodes may be disconnected if you use the LCD panel under dew-condensing environment.
- v. The characteristics of the semiconductor devices may be affected when they are exposed to light, possibly resulting in malfunctioning of the ICs. To prevent such malfunctioning of the ICs, make sure the application and the mounting of the panel are designed so that the IC is not exposed to light.

### 9.3 Static Electricity

Ground soldering iron tips, tools and testers when you operate. Also ground your body when handling the products and store the products in an anti-electrostatic container.

### 9.4 Storage

Store the products in a dark place where the temperature is within the range of  $25\pm 10^{\circ}\text{C}$  and with low humidity (65%RH or less). Do not store the LCD product in an atmosphere containing organic solvents or corrosive gases.

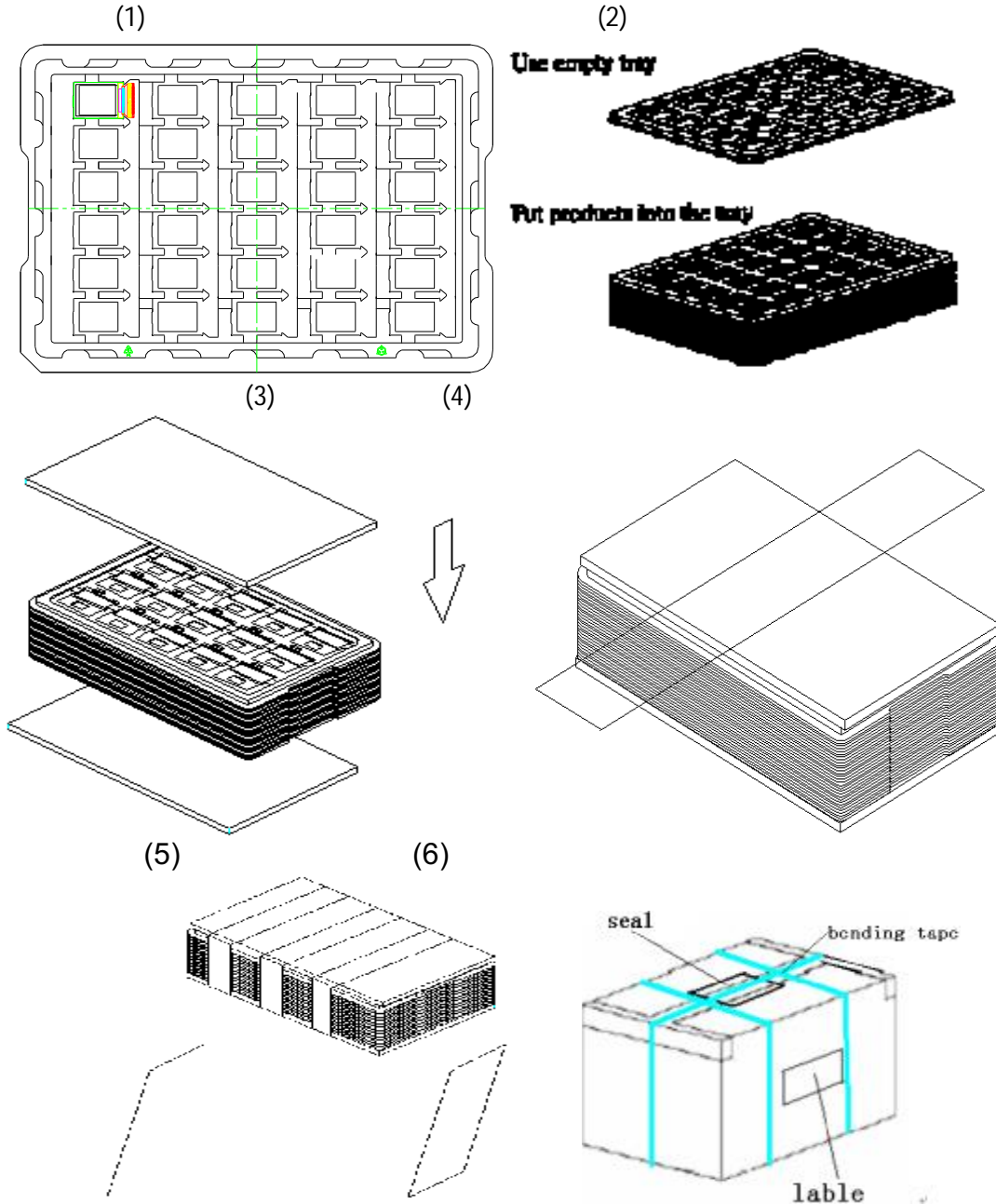
### 9.5 Cleaning

Do not wipe the polarizer with dry cloth, as it might cause scratching. Wipe the polarizer with a soft cloth soaked with petroleum IPA. Other chemical might damage the panel.



## 10. Packing (Reference only) (包装)

Packing Method



1. Put module into tray cavity :
2. Tray stacking
3. Put 1 cardboard under the tray stack and 1 cardboard above:
4. Fix the cardboard to the tray stack with adhesive tape:
5. Put the tray stack into carton.
6. Carton sealing with adhesive tape.