



Product Specification

Customer: _____

Model Name: H028HQ30E2542

Date: _____

Version: _____

☒ **Preliminary Specification**

☐ **Final Specification**

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by

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1. Record of Revision

Rev	Issued Date	Description	Editor
1.0	2022/08/17	First Release	gl.Liu

2. General Specifications

Feature		Spec
Characteristics	Size	2.8inch
	Resolution	240(horizontal)*320(Vertical)
	Interface	16-bit MCU
	Connect type	Connector
	Display Colors	65K
	Technology type	a-Si
	Pixel pitch (mm)	0.180x 0.180
	Pixel Configuration	R.G.B.Stripe
	Display Mode	Normally White
	Driver IC	ST7789V
	Viewing Direction	12'clock
	Gray Scale Inversion Direction	6O'clock
Mechanical	LCM +CTP(W x H x D) (mm)	51.80*82.54*3.25
	Active Area(mm)	43.2*57.6
	With /Without TSP	Without
	Weight (g)	TBD
	LED Numbers	4LEDs

Note 1: Viewing direction for best image quality is different from TFT definition; there is a 180 degree shift.

Note 2: Requirements on Environmental Protection: RoHS

Note 3: LCM weight tolerance: +/- 5%

3. Input/output Terminals

PIN NO	PIN NAME	DESCRIPTION
1	LEDK1-4	Power for LED backlight (Cathode)
2	LEDA	LED backlight anode
3	GND	Ground
4	RESET	Reset signal input terminal, active at 'L'
5	DB15	DATA BUS
6	DB14	DATA BUS
7	DB13	DATA BUS
8	DB12	DATA BUS
9	DB11	DATA BUS
10	DB10	DATA BUS
11	DB9	DATA BUS
12	DB8	DATA BUS
13	DB7	DATA BUS
14	DB6	DATA BUS
15	DB5	DATA BUS
16	DB4	DATA BUS
17	DB3	DATA BUS
18	DB2	DATA BUS
19	DB1	DATA BUS
20	DB0	DATA BUS
21	RD	Read signal
22	WR	Write signal
23	RS	This pin is used to select "Data or Command" in
24	CS	
25	NC	NO connect
26	NC	NO connect
27	NC	NO connect
28	NC	NO connect
29	GND	Ground
30	VCC	power supply

4. Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	V _{CC}	-0.3	4.6	V	
Input Voltage	IOVCC	-0.3	4.6	V	
Operating Temperature	T _{OPR}	-20	70	°C	
Storage Temperature	T _{STG}	-30	80	°C	

5. Electrical Characteristics

Driving TFT LCD Panel

Ta = 25 °C

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Analog Supply Voltage		V _{CC}	2.5	2.8	3.3	V	
Logic Signal Input /Output Voltage		IOVCC	1.65	1.8	3.3	V	
Input Signal Voltage	Low Level	V _{IL}	VSS	-	0.3x IOVCC	V	
	High Level	V _{IH}	0.7x IOVCC	-	IOVCC	V	
TFT Common Electrode		V _{COMH}	2.5	-	5	V	
TFT Gate ON Voltage		V _{GH}	10	-	16	V	
TFT Gate ON Voltage		V _{GL}	-10	-	-5	V	

Driving Backlight

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I _F	-	80	100	mA	
Forward Voltage	V _F	2.9	3.1	3.2	V	
Backlight Power consumption	W _{BL}	-	0.248	0.32	W	
LED Lifetime		25000	-	-	Hrs	

Note 1: Each LED: I_F =20 mA, V_F =3.1V.

Note 2: Optical performance should be evaluated at Ta=25°C only.

Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness.

Typical operating life time is estimated data.

6. Interface Timing

6.1 8080 Series MCU Parallel Interface Characteristics: 18/16/9/8-bit Bus

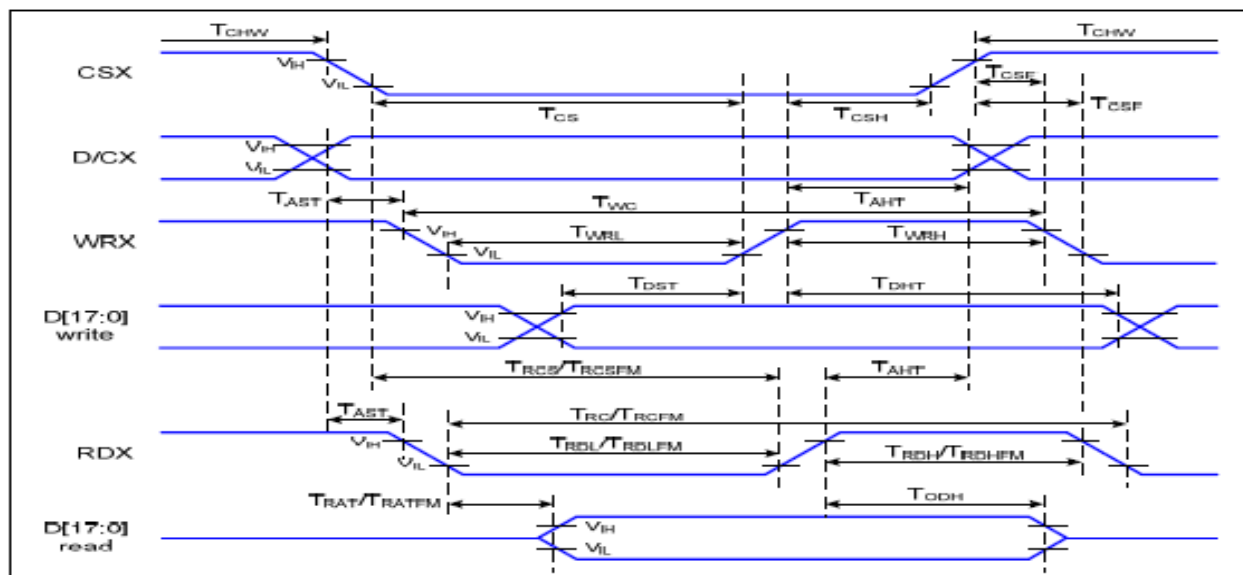


Figure 1 Parallel Interface Timing Characteristics (8080-Series MCU Interface)

$V_{DDI}=1.65$ to $3.3V$, $V_{DD}=2.4$ to $3.3V$, $AGND=DGND=0V$, $T_a = -30$ to 70 °C

Signal	Symbol	Parameter	Min	Max	Unit	Description
D/CX	T_{AST}	Address setup time	0		ns	-
	T_{AHT}	Address hold time (Write/Read)	10		ns	
CSX	T_{CHW}	Chip select "H" pulse width	0		ns	-
	T_{CS}	Chip select setup time (Write)	15		ns	
	T_{RCS}	Chip select setup time (Read ID)	45		ns	
	T_{RCSFM}	Chip select setup time (Read FM)	355		ns	
	T_{CSF}	Chip select wait time (Write/Read)	10		ns	
	T_{CSH}	Chip select hold time	10		ns	
WRX	T_{WC}	Write cycle	66		ns	-
	T_{WRH}	Control pulse "H" duration	15		ns	
	T_{WRL}	Control pulse "L" duration	15		ns	
RDX (ID)	T_{RC}	Read cycle (ID)	160		ns	When read ID data
	T_{RDH}	Control pulse "H" duration (ID)	90		ns	
	T_{RDL}	Control pulse "L" duration (ID)	45		ns	
RDX (FM)	T_{RCFM}	Read cycle (FM)	450		ns	When read from frame memory
	T_{RDHFM}	Control pulse "H" duration (FM)	90		ns	
	T_{RDLFM}	Control pulse "L" duration (FM)	355		ns	
D[17:0]	T_{DST}	Data setup time	10		ns	For CL=30pF

6.2 Reset Timing:

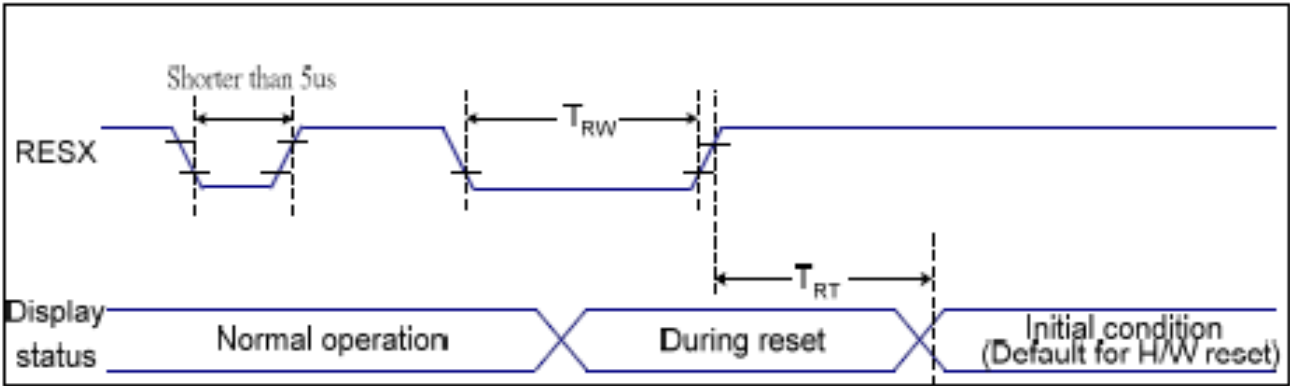


Figure 7 Reset Timing

VDDI=1.05 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=-30 ~ 70 ℃

Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
				120 (Note 1, 6, 7)	ms

Table 8 Reset Timing

7. Optical Characteristics

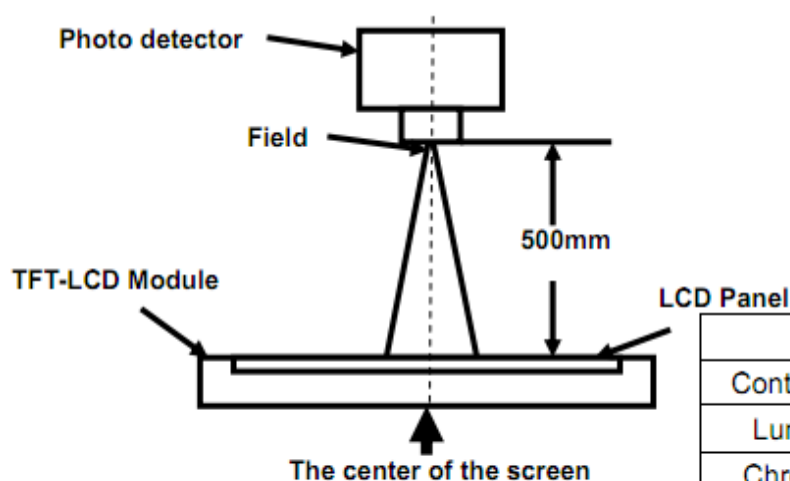
Items	Symbol	Condition	Min	Typ	Max	Unit		Remark
Viewing angles	θ_T	Center CR $\geq$ 10	-	50	-	Degree		Note2
	θ_B		-	20	-			
	θ_L		-	45	-			
	θ_R		-	45	-			
Contrast Ratio	CR	$\Theta = 0$	400	500	-	-		Note1, Note3
Response Time	T_{ON}	25°C	-	20	30	ms		Note1, Note4
	T_{OFF}		-	25	35			
Chromaticity	White	Backlight is on	0.26	0.31	0.36	-		Note1, Note5
			0.28	0.33	0.38	-		
Uniformity	U		80	-	-	%		Note1, Note6
NTSC			-	50	-	%		Note5
Luminance	L		200	250	-	nits		Note1, Note7

Test Conditions:

1. IF= 20mA (one channel), the ambient temperature is 25.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

Note 2: Definition of viewing angle range and measurement system.

Viewing angle is measured at the center point of the LCD by CONOSCOPE (ergo-80).

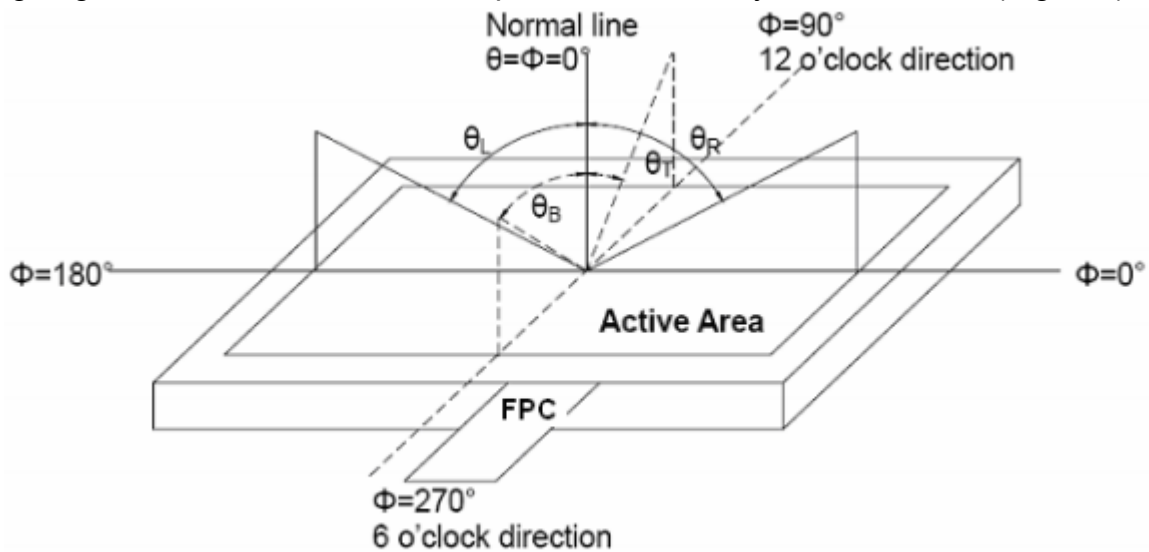


Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

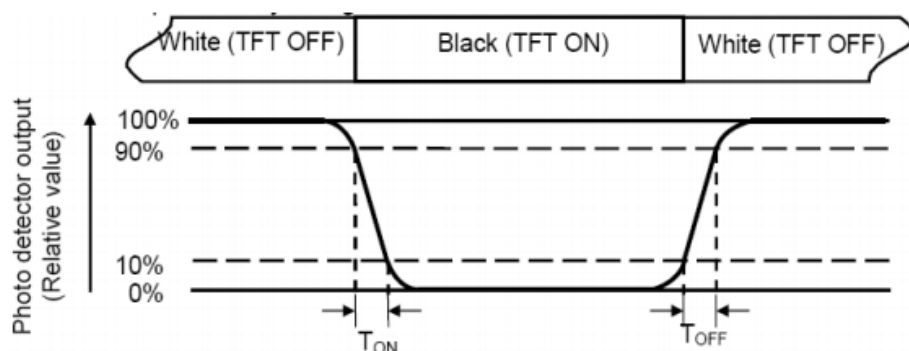
“White state “: The state is that the LCD should drive by V_{white} .

“Black state”: The state is that the LCD should drive by V_{black} .

V_{white} : To be determined V_{black} : To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931).

Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (U)} = L_{\text{min}} / L_{\text{max}}$$

L-----Active area length W----- Active area width

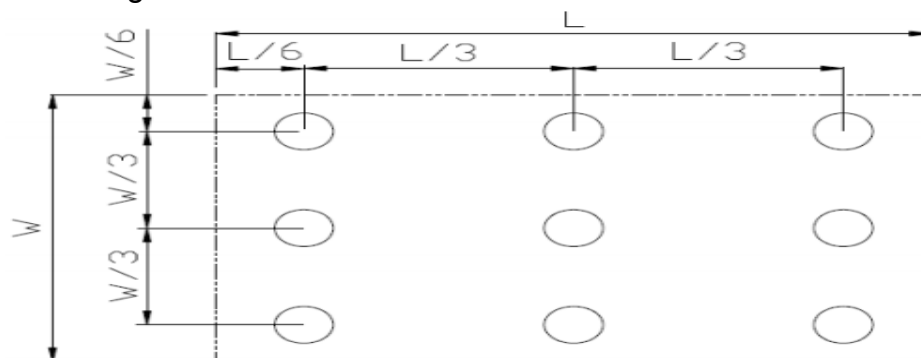


Fig. 2 Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

8. Environmental / Reliability Tests

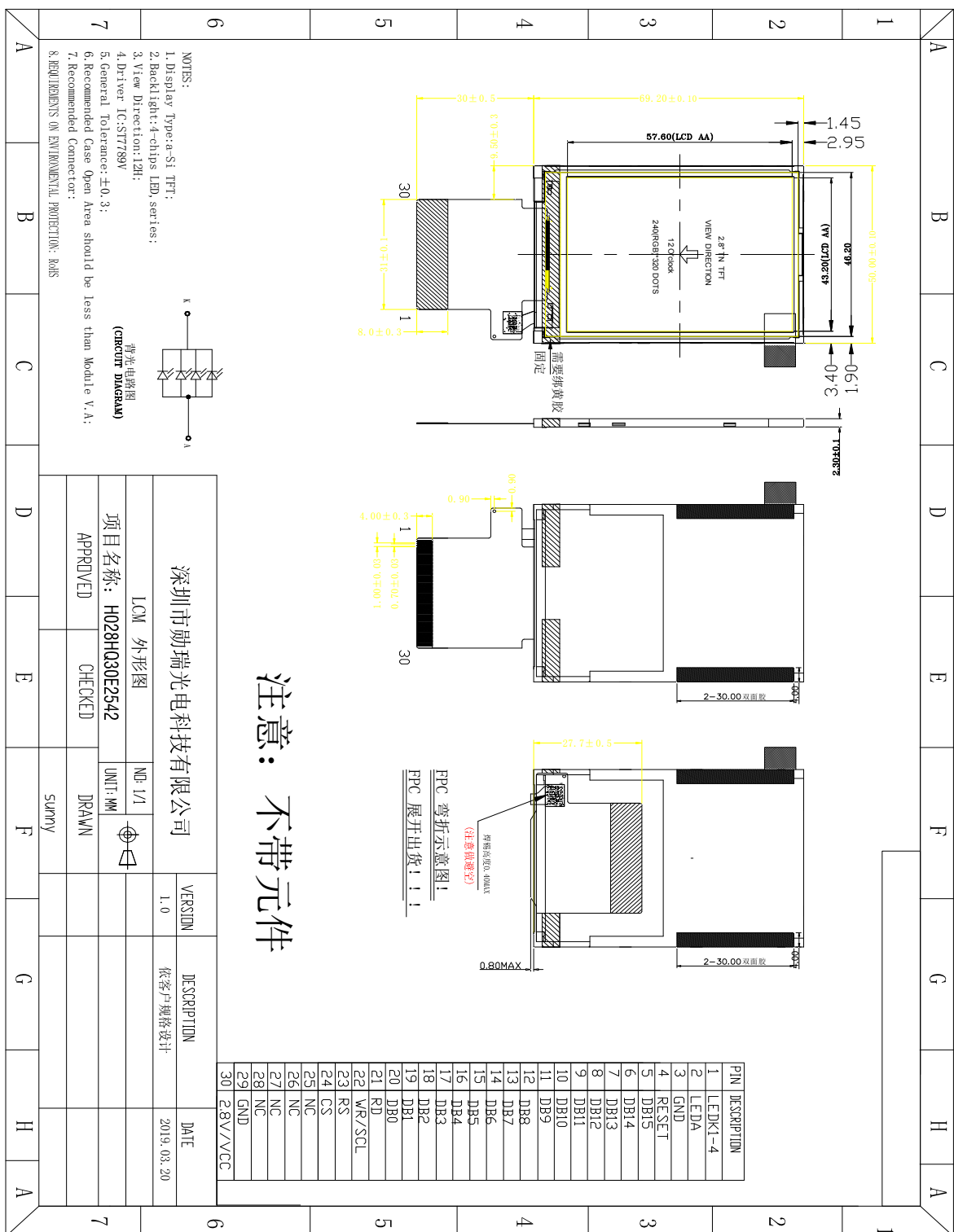
No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts= +70℃, 96hrs	Note 1 IEC60068-2-2, GB2423. 2-89
2	Low Temperature Operation	Ta= -20℃, 96hrs	Note 2 IEC60068-2-1 GB2423.1-89
3	High Temperature Storage	Ta= +80℃, 96hrs	IEC60068-2-2 GB2423. 2-89
4	Low Temperature Storage	Ta= -30℃,96hrs	IEC60068-2-1 GB/T2423.1-89
5	High Temperature & Humidity Storage	Ta= +60℃, 90% RH max, 96hours	IEC60068-2-3 GB/T2423.3-2006
6	Thermal Shock (Non-operation)	-30℃ 30 min ~ +80℃ 30 min Change time: 5min, 30 Cycle	Start with cold temperature, end with high temperature IEC60068-2-14, GB2423.22-87
7	Electro Static Discharge (Operation)	C=150pF, R=330 Ω, 5 points/panel Air:±8KV, 5 times; Contact: ±4KV, 5times; (Environment: 15℃ ~35℃, 30% ~ 60%, 86Kpa ~ 106Kpa)	IEC61000-4-2 GB/T17626.2-1998

8	Vibration (Non-operation)	Frequency range: 10~55Hz, Stroke: 1.mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X .Y. Z. (package condition)	IEC60068-2-6 GB/T2423.5-1995
9	Shock (Non-operation)	60G 6ms, $\pm X$, $\pm Y$, $\pm Z$, 3 times for each direction	IEC60068-2-27 GB/T2423.5-1995
10	Package Drop Test	Height: 80 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8-1995

Note: 1. TS is the temperature of panel's surface.

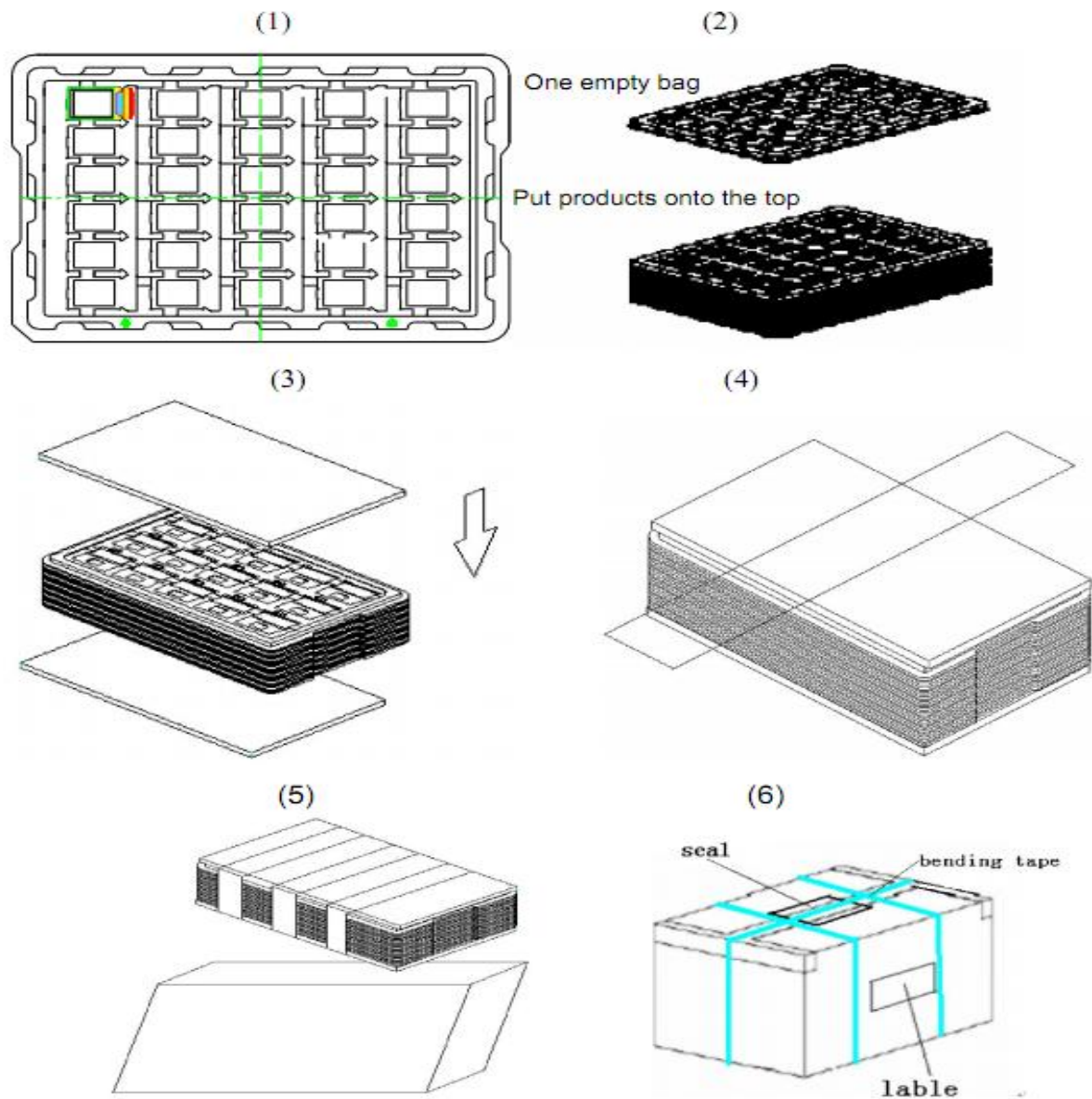
Note: 2. Ta is the ambient temperature of sample.

9. Mechanical Drawing



10. Packing

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.

11. Precautions for Use of LCD modules

11.1 Handling Precautions

11.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

11.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

11.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

11.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

11.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

11.1.6 Do not attempt to disassemble the LCD Module.

11.1.7 If the logic circuit power is off, do not apply the input signals.

11.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

11.1.8.1 Be sure to ground the body when handling the LCD Modules.

11.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

11.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

11.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

11.2 Storage Precautions

11.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

11.2.2 The LCD modules should be stored under the storage temperature range if the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ~ 40℃ Relatively humidity: ≤80%

11.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

11.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.