CDTech (H.K.) Electronics Limited

Product Specifications

Customer	
Model Name	S035HV09
Description	Standard LCD Module 320(RGB)x480 Dots 3.5" TFT LCD
Date	2014/03/05
Revision	2.0

Customer Approval	
Date	
The above signature represents that the product specifications, testing regulation, and warranty in the specifications are accepted	

Engineering			
Check	**Date**	**Prepared**	**Date**
	2014/03/05		2014/03/05

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Table of Contents

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1. Record of Revision

Rev	Issued Date	Description	Editor
1.0	2014/1/15	First Release.	shiyaoliang
2.0	2014/3/5	Update LCD	shiyaoliang

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2. General Specifications

Feature		Spec
Characteristics	Size	3.5inch
	Resolution	320(horizontal)*480(Vertical)
	Interface	MCU8080 16 /16 bit RGB interface
	Connect type	connector
	Color Depth	65K
	Technology type	a-Si
	Display Spec. Pixel pitch (mm)	0.153x 0.153
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	Normally Black
	Driver IC	ILI9488
	Surface Treatment	HC
	Viewing Direction	6 O'clock
Mechanical	LCM (W x H x D) (mm)	54.66*82.94*2.2
	Active Area(mm)	48.96 x 73.44
	With /Without TSP	Without TSP
	Weight (g)	TBD
	LED Numbers	6 LEDs

Note 1: Viewing direction is follow the data which measured by optics equipment.

Note 2: Requirements on Environmental Protection: RoHS

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

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3. Input/Output Terminals

No.	Symbol	Description
1	K1	System Ground
2	K2	Backlight LED Cathode
3	K3	Backlight LED Cathode
4	K4	Backlight LED Cathode
5	K5	Backlight LED Cathode
6	K6	Backlight LED Cathode
7	A	Backlight LED Anode.
8	A	Backlight LED Anode.
9	DE	Data enable signal.
10	VCC	Power supply.
11	VCC	Power supply.
12	IOVCC	Digital power supply.
13	IOVCC	Digital power supply.
14	GND	System Ground
15	SDA	Serial Data.
16	CS	A chip select signal.
17	RS	Parallel interface (D/CX): The signal for command or parameter select. Low: Command. High: Parameter.
18	WR /SCL	Serves as a write signal and writes data at the rising edge./ Serial Clock.
19	RD	Serves as a read signal and read data at the rising edge.
20~35	DB0~DB15	Data bus
36	DOCLK	Dot clock signal.
37	RESET	The external reset input.
38	IM0	Tearing effect output.
39	HSYNC	Horizontal sync.
40	VSYNC	Vorizontal sync.

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4．Absolute Maximum Ratings

4.1 Driving TFT LCD Panel

Item	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	V_{DD}	-0.3	5	V	
Operating Temperature	T_{OPR}	-20	70	℃	
Storage Temperature	T_{STG}	-30	80	℃	

5. Electrical Characteristics

5.1 Driving TFT LCD Panel

Parameter	Symbol	Condition	Specification			Unit
			Min.	Typ.	Max.	
Analog power supply voltage	V_{CI}	Operating voltage	2.5	3.7	4.8	V
Digital power supply voltage	V_{IOVCC}	I/O supply voltage	1.65	1.8	1.95	V
Analog power supply voltage noise	V_{CI_NOISE}	Noise window, 0 to 100MHz	-	-	500	mV
Digital power supply voltage noise	V_{IOVCC_NOISE}	Noise window, 0 to 100MHz	-	-	500	mV

5.2　Driving Backlight

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	-	120	-	mA	
Forward Voltage	V_F	3.0	3.2	3.4	V	
Backlight Power consumption	W_{BL}	-	TBD	-	nW	

Note 1: Each LED : IF =20 mA, VF =3.2V.

Note 2: Optical performance should be evaluated at Ta=25℃ 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.
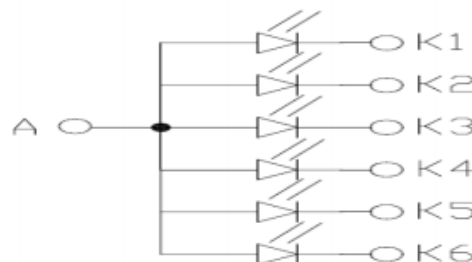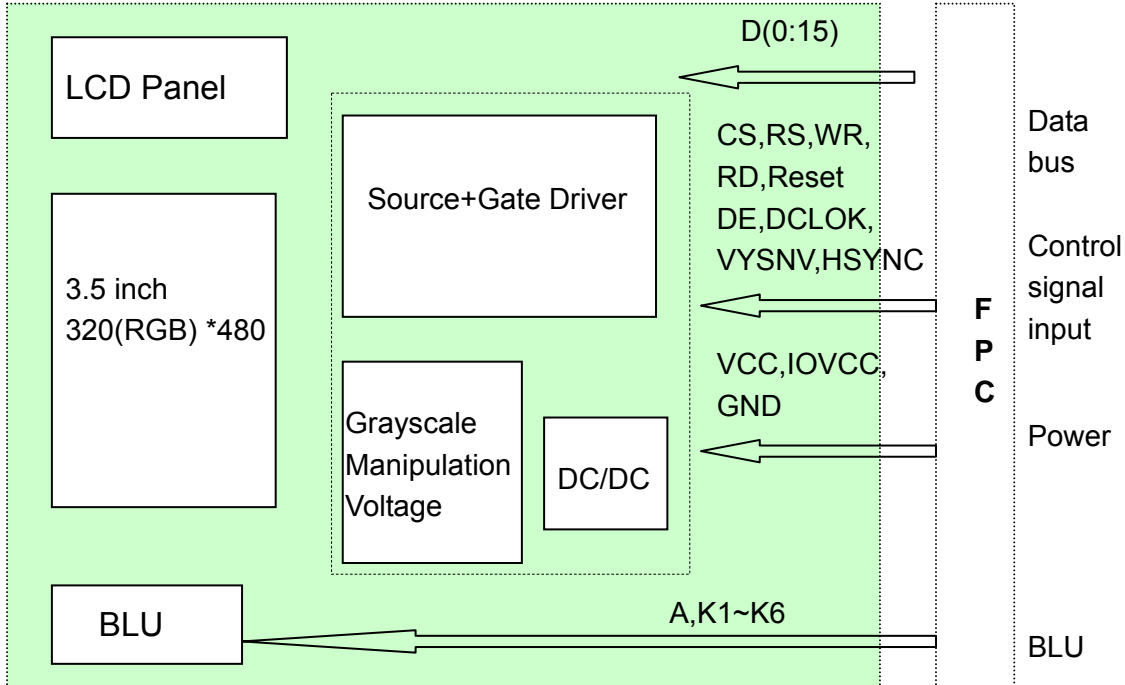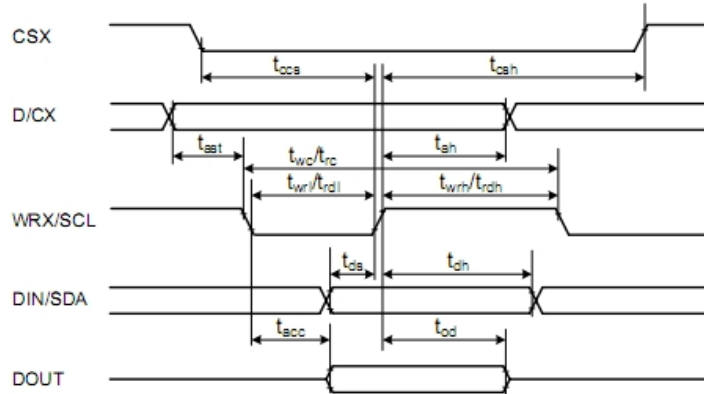

Figure : LED connection of backlight

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5.3   Block Diagram

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6．Interface Timing

6.1   Display Bus (18/16/9/8 bit) Interface Timing Characteristics

Signal	Symbol	Parameter	min	max	Unit	Description
D/CX	tast	Address setup time	10	-	ns	
	taht	Address hold time (Write/Read)	10	-	ns	
CSX	tcs	Chip Select setup time (Write)	20	-	ns	
	trcs	Chip Select setup time (Read)	20	-	ns	
	tcaf	Chip Select Wait time (Write/Read)	20	-	ns	
WRX	twc	Write cycle	100	-	ns	
	twrh	Write Control pulse H duration	30	-	ns	
	twrl	Write Control pulse L duration	20	-	ns	
RDX	trc	Read cycle	450	-	ns	
	trdh	Read Control pulse H duration	250	-	ns	
	trdl	Read Control pulse L duration	170	-	ns	
DB[17:0],	twds	Write data setup time	15	-	ns	
DB[15:0],	twdh	Write data hold time	25	-	ns	For maximum CL=30pF
DB[8:0],	tracc	Read access time	10	340	ns	For minimum CL=8pF
DB[7:0]	trod	Read output disable time	10	-	ns	

Note: Logic high and low levels are specified as 30% and 70% of IOVCC for input signals.

Note: Ta = -30 to 70 °C, IOVCC=1.65V to 3.3V, VCI=2.5V to 3.3V, GND=0V

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6.2   DBI Interface Timing Characteristics

Signal	Symbol	Parameter	Min.	Max.	Unit	Description
CSX	t_{css}	Chip select setup time (Write)	40	-	ns	
	t_{csh}	Chip select hold time (Write)	40	-	ns	
D/CX	t_{ast}	Address setup time	10		ns	
	t_{ah}	Address hold time (Write/Read)	10		ns	
WRX/SCL (Write)	t_{wc}	Write cycle	100		ns	
	t_{wrh}	SCL High duration (write)	40		ns	
	t_{wrl}	SCL Low duration (write)	40		ns	
WRX/SCL (Read)	t_{rc}	Read cycle	300		ns	
	t_{rdh}	SCL High duration (read)	120		ns	
	t_{rdl}	SCL Low duration (read)	120		ns	
DIN/SDA (Driver IC)	t_{ds}	Data setup time	30		ns	
	t_{dh}	Data hold time	30		ns	
DOUT (Driver IC)	t_{acc}	Access time	-	110	ns	
	t_{od}	Output disable time	10		ns	

6.3   DPI Interface Timing Characteristics
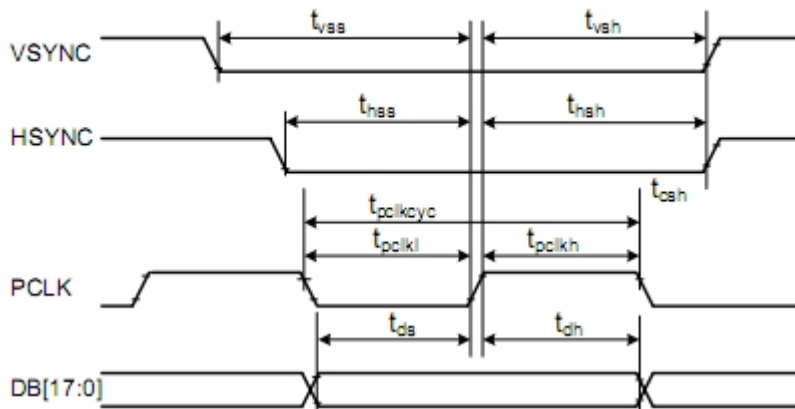
Parameter	Symbol	Condition	Min.	Max.	Unit
Vsync Setup Time	t_{vss}		15	-	ns
Vsync Hold Time	t_{vsh}		15	-	ns
Hsync Setup Time	t_{hss}		15	-	ns
Hsync Hold Time	t_{hsh}		15	-	ns
Pixel Clock Duty Cycle	$t_{pclkcyc}$		33	67	%
Pixel Clock Low Duration	t_{pclkl}		15	-	ns
Pixel Clock High Duration	t_{pclkh}		15	-	ns
Data Setup Time	t_{ds}		15	-	ns
Data Hold Time	t_{dh}		15	-	ns

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7. Optical Characteristics

Items		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angles		θ_T	Center CR≥10	45	55	-	Degree.	Note2
		θ_B		60	60	-		
		θ_L		60	70	-		
		θ_R		60	70	-		
Contrast Ratio		CR	Θ =0	--	500	-	-	Note1, Note3
Response Time		T_{ON}	25°C	14	20	-	ms	Note1, Note4
		T_{OFF}		16	20			
Chromaticity	White	X_W	Backlight is on	0.280	0.300	0.320	-	Note1, Note5
		Y_W		0.32	0.340	0.360	-	
	Red	X_R		0.617	0.637	0.657	-	
		Y_R		0.318	0.338	0.358	-	
	Green	X_G		0.269	0.289	0.309	-	
		Y_G		0.569	0.589	0.619	-	
	Blue	X_B		0.116	0.136	0.156	-	
		Y_B		0.123	0.143	0.163	-	
Luminance		. L		-	250			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.

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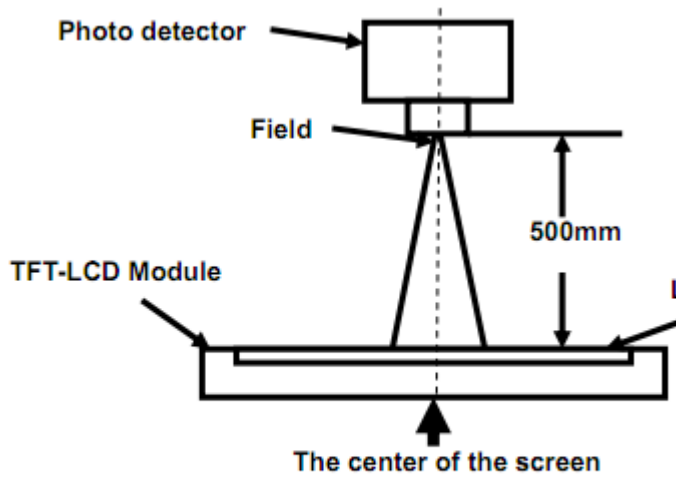
Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

Note 2: Definition of viewing angle range and measurement system.
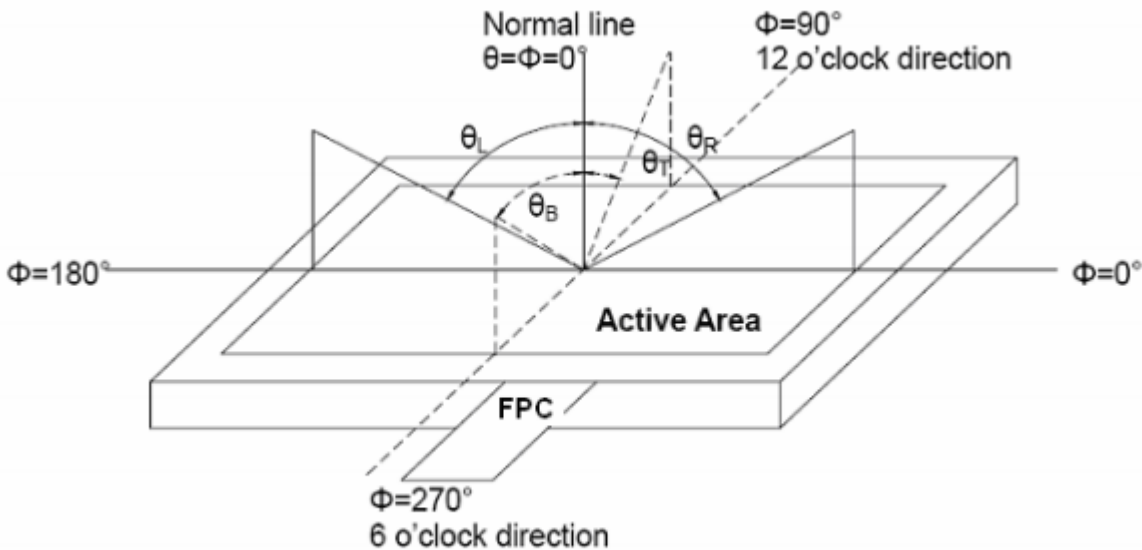Viewing angle is measured at the center point of the LCD by CONOSCOPE (ergo-80).

Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

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"White state ":The state is that the LCD should driven by Vwhite.

"Black state": The state is that the LCD should driven by Vblack.

Vwhite: To be determined   Vblack: 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 (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.
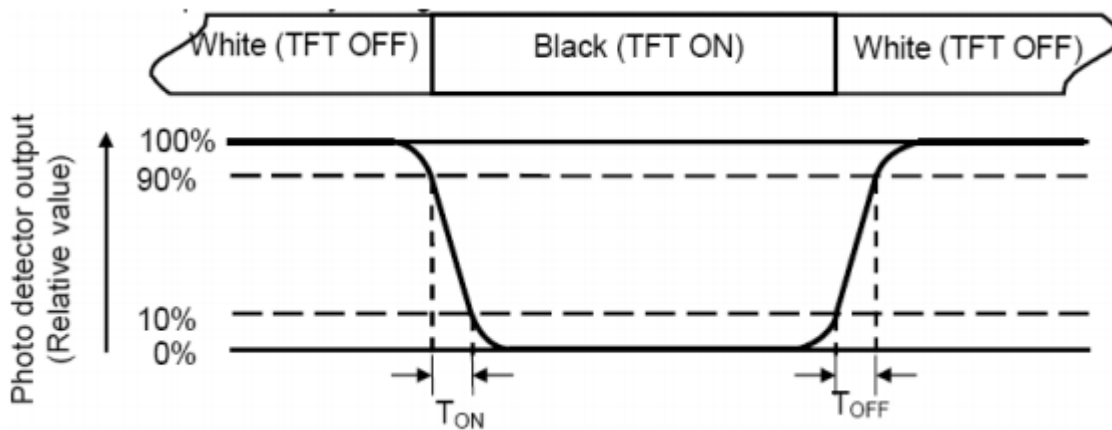
Note 5: Definition of color chromaticity (CIE1931)

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.

Luminance Uniformity(U) = Lmin/ Lmax

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

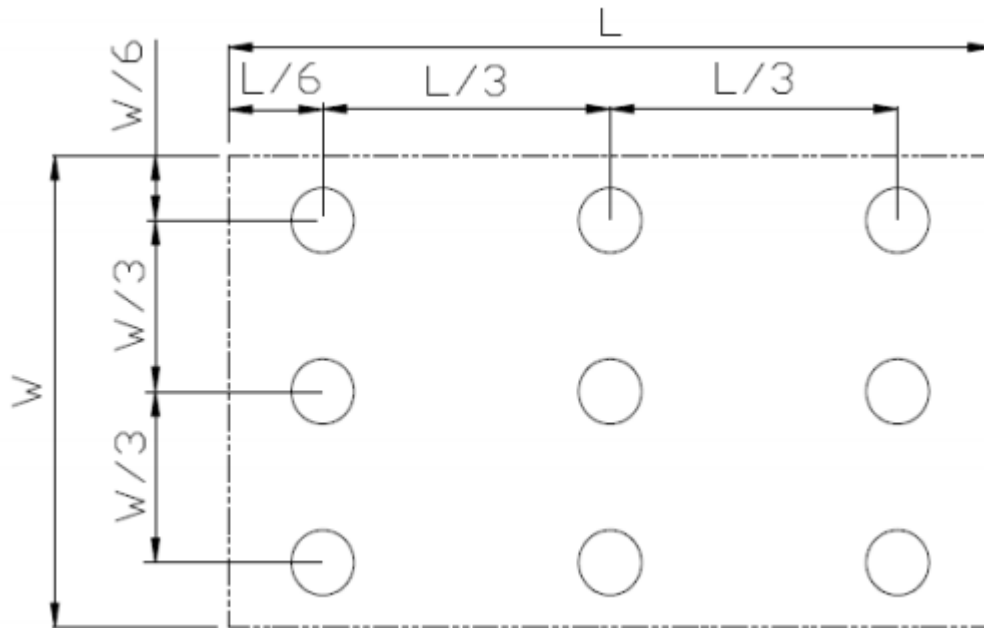# CDTech (H.K.) Electronics Limited

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.

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8. Environmental / Reliability Tests

| No	Test Item	Condition	Remarks
1	High Temperature Opeartion	Ts= +70℃, 240hrs	Note 1 IEC60068-2-2, GB2423. 2-89
2	Low Temperature Opeartion	Ta= -20℃, 240hrs	Note 2 IEC60068-2-1 GB2423.1-89
3	High Temperature Storage	Ta= +80℃, 240hrs	IEC60068-2-2 GB2423. 2-89
4	Low Temperature Storage	Ta= -30℃, 240hrs	IEC60068-2-1 GB/T2423.1-89
5	High Temperature & Humidity Storage	Ta= +60℃, 90% RH max, 160 hours	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 (Opeartion)	C=150pF, R=330 Ω, 5 points/panel Air:±8KV, 5 times; Contact: ±4KV, 5 times; (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, ± X, ±Y , ± 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. T_S is the temperature of panel's surface.

    2. Ta is the ambient temperature of sample.

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9. Mechanical Drawing

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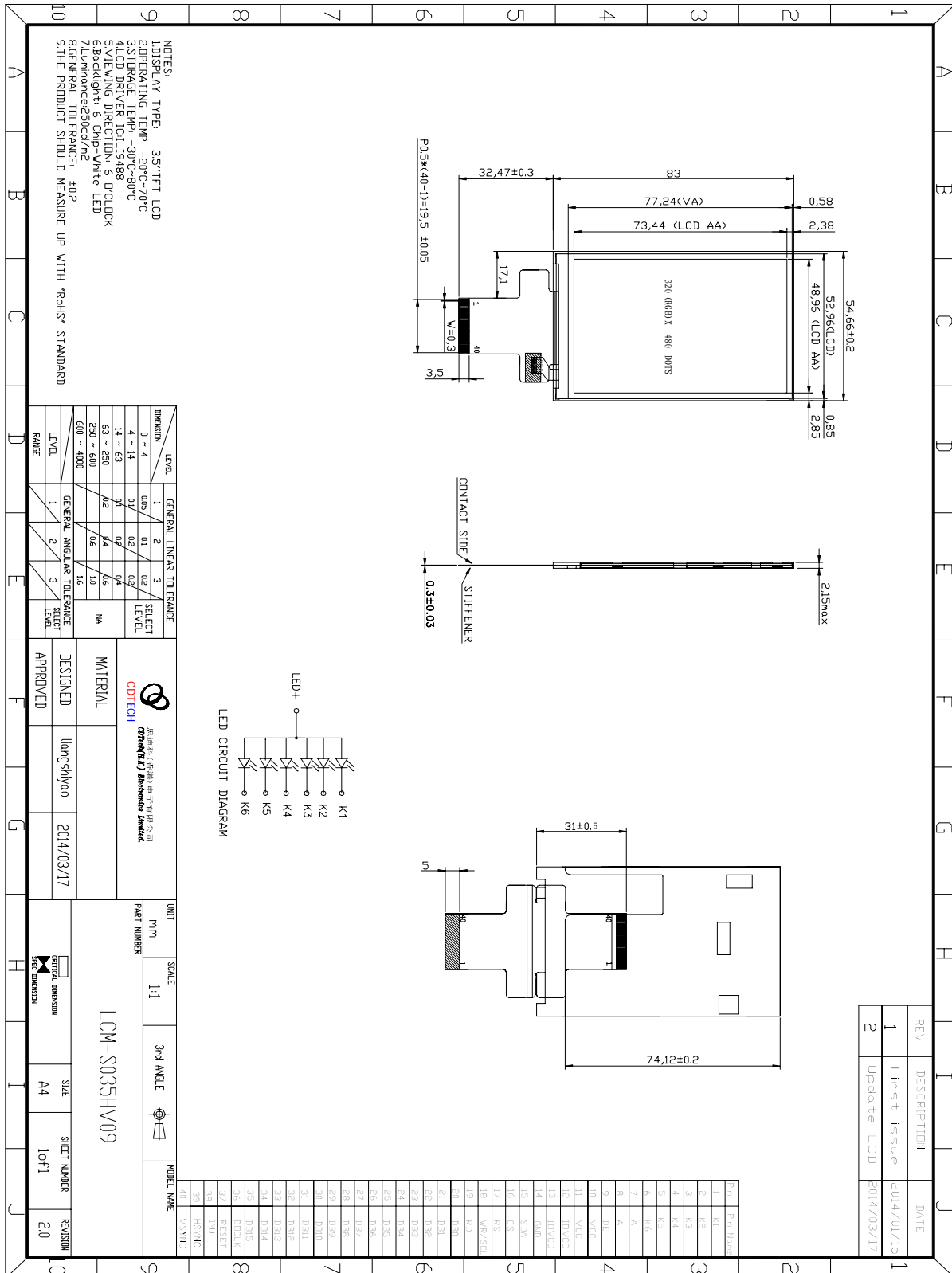
10.   Packing

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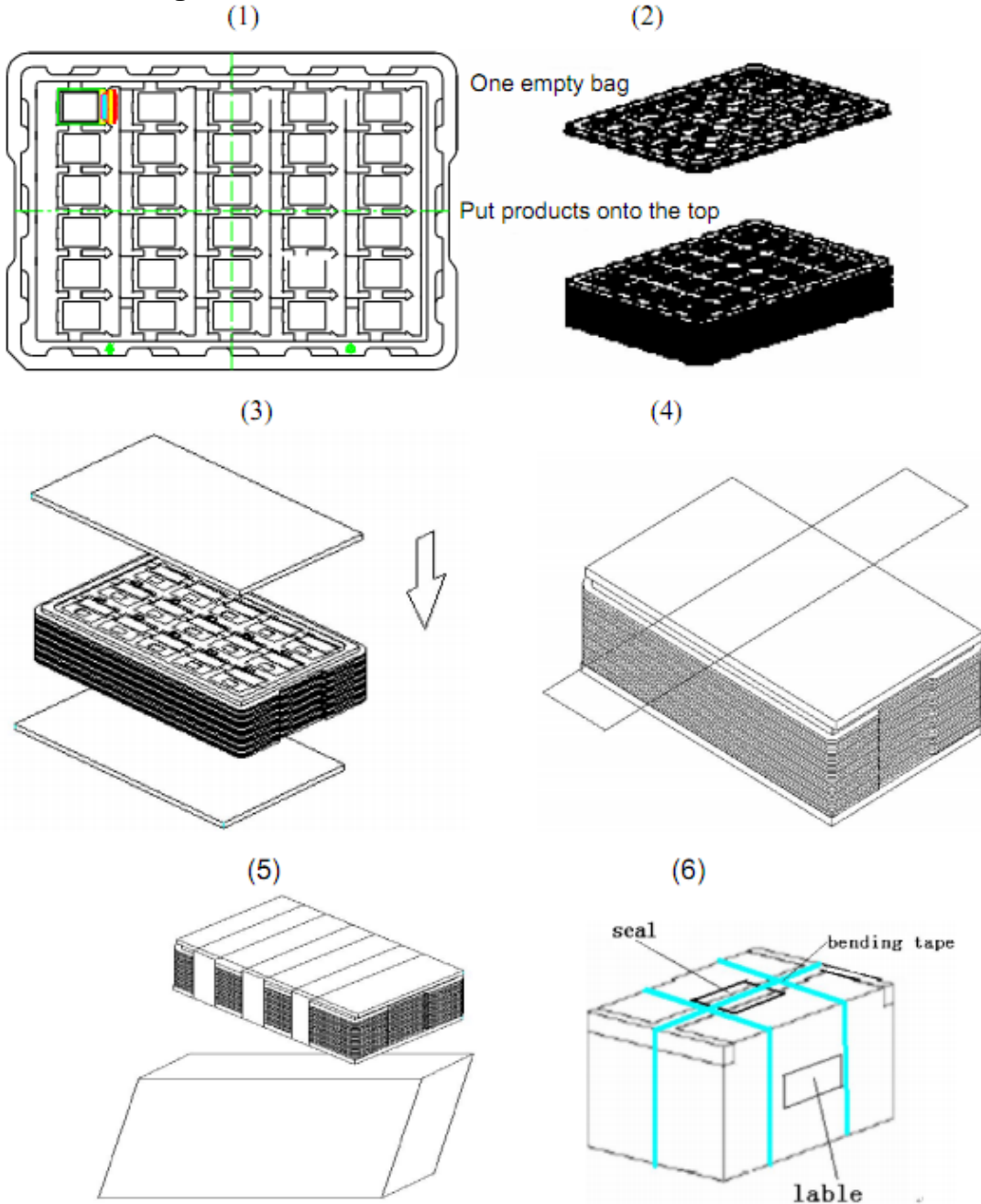
1. Put module into tray cavity:
2. Tray stacking
3. Put 1 cardboard under the tray stack and 1 cardboard above:
4. Fix the cardboard to the tray stack with adhesive tape:
5. Put the tray stack into carton.
6. Carton sealing with adhesive tape.

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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.