东莞奇创力显示器有限公司

Kitronix (Dong guan) Ltd.

FOR APPROVAL

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YOUR MODULE NO.: _____   OUR MODULE NO.: ___K350QVG-V1-F___

YOUR SPEC NO.: _____   OUR FULL SPEC NO.: __FS-K350QVG-V1-F-04__

APPROVED BY		

APPROVED BY CUSTOMER

Kitronix (Dong Guan) Ltd.

No. A20, Luyi Road, Tianxin Country, Tangxia Town, Dongguan City, Guangdong Province.

K350QVG-V1-F

Product

Standard LCD Module
320 x RGB x 240 Dots
3.5" 262K colors TFT display
Wide temperature
With white LED backlight
With Touch Panel

Kitronix (Dong Guan) Ltd.

No. A20, Luyi Road, Tianxin Country, Tangxia Town, Dongguan City, Guangdong Province.

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1. Document revision history :

DOCUMENT REVISION	DATE	DESCRIPTION	PREPARED BY	APPROVED BY
01	2008.04.28	First Release.	Serlee	
02	2008.05.26	Change mistake and Interface description.	Van Ng	
03	2008.12.11	Correct the mistake of Input voltage and add the Inspection Standard.	Van Ng	
04	2008.12.17	Change the mechanical specifications.	Van Ng	

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2. General Description

- 3.5"(diagonal), 320 x RGB x 240 dots, 262K colors, Transmissive, TFT LCD module.
- Viewing Direction: 12 o'clock.
- Driving IC: SSD2119 or equivalent TFT controller/driver.
- 18-bits data bus (parallel RGB interface/8080 parallel system interface).
- With Touch Panel.
- With internal voltage booster.
- Logic voltage: 3.3V (typ.).

3. Mechanical Specifications

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Table 1

Parameter		Specifications	Unit
Outline dimensions		76.9(W) x 63.9(H) x 4.4(D) (Exclude FPC, cables of backlight)	mm
Color TFT 320xRGBx240	View area	72.88(W) x 55.36(H)	mm
	TP view area	71.58 (W) x 54.2(H)	mm
	LCD active area	70.08(W) x 52.56(H)	mm
	Display format	320 x RGB x 240	dots
	Color configuration	RGB stripes	-
	Dot size	0.219(RGB)(W) x 0.219(H)	mm
Weight		TBD	grams

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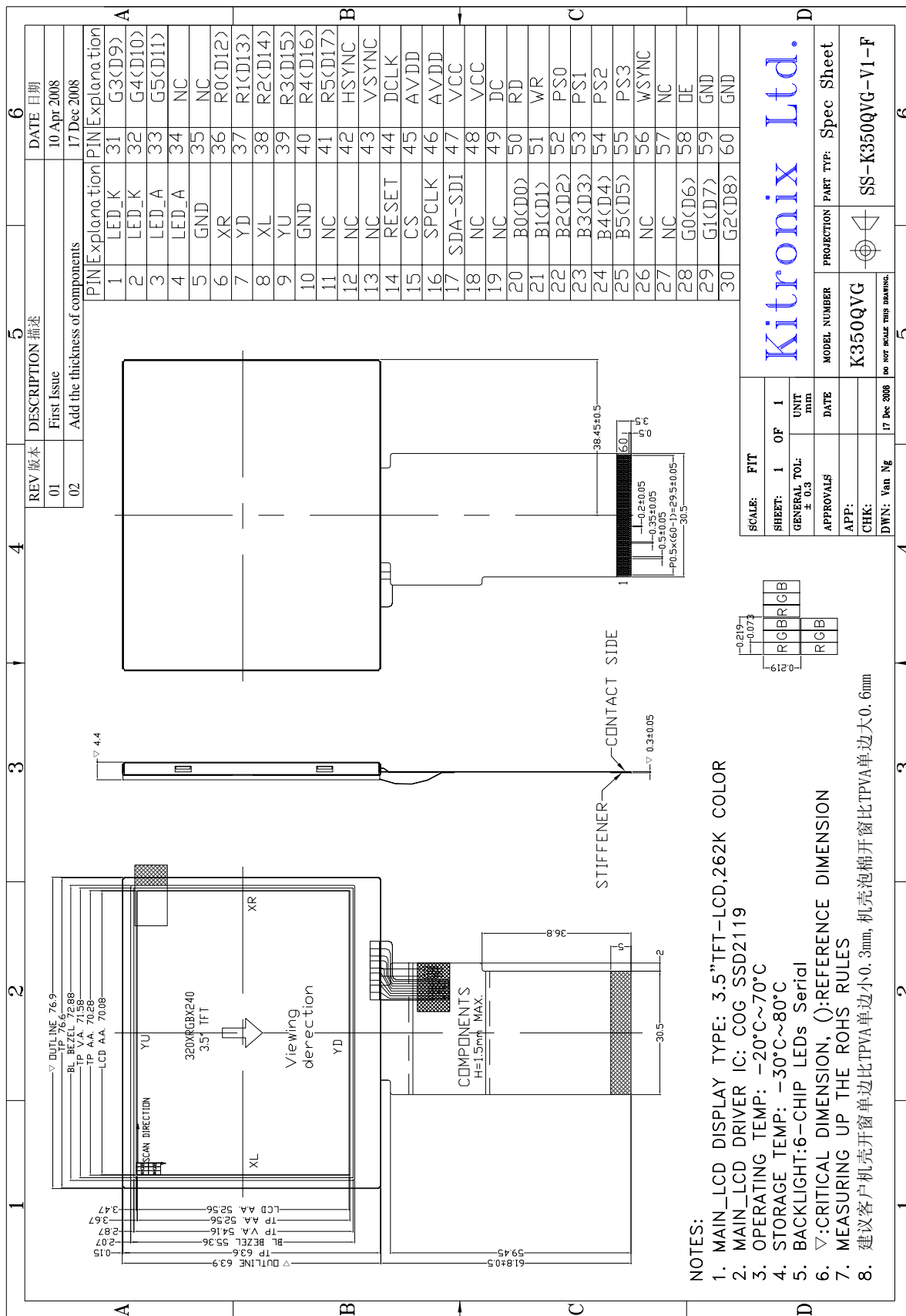
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Figure 1: Outline Drawing

PIN	Explanation	PIN	Explanation
1	LED_K	31	G3(D9)
2	LED_K	32	G4(D10)
3	LED_A	33	G5(D11)
4	LED_A	34	NC
5	GND	35	NC
6	XR	36	R0(D12)
7	YD	37	R1(D13)
8	XL	38	R2(D14)
9	YU	39	R3(D15)
10	GND	40	R4(D16)
11	NC	41	R5(D17)
12	NC	42	HSYNC
13	NC	43	VSYNC
14	RESET	44	DCLK
15	CS	45	AVDD
16	SPCLK	46	AVDD
17	SDA-SDI	47	VCC
18	NC	48	VCC
19	NC	49	DC
20	B0(D0)	50	RD
21	B1(D1)	51	WR
22	B2(D2)	52	PS0
23	B3(D3)	53	PS1
24	B4(D4)	54	PS2
25	B5(D5)	55	PS3
26	NC	56	WSYNC
27	NC	57	NC
28	G0(D6)	58	DE
29	G1(D7)	59	GND
30	G2(D8)	60	GND

REV 版本	DESCRIPTION 描述	DATE 日期
01	First Issue	10 Apr 2008
02	Add the thickness of components	17 Dec 2008

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PART TYP.: Spec Sheet
SS-K350QVG-V1-F
MODEL NUMBER
K350QVG
PROJECTION
DO NOT SCALE THIS DRAWING.

SCALE:	FIT		
SHEET:	1	OF	1
GENERAL TOL. ± 0.3		UNIT mm	
APPROVALS		DATE	
APP:			
CHK:			
DWN: Van Ng		17 Dec 2008	

CONTACT SIDE

STIFFENER

COMPONENTS H=1.5mm MAX.

Viewing derection

320XRGBX240 3.5" TFT

SCAN DIRECTION

NOTES:
1. MAIN_LCD DISPLAY TYPE: 3.5"TFT-LCD,262K COLOR
2. MAIN_LCD DRIVER IC: COG SSD2119
3. OPERATING TEMP: -20°C~70°C
4. STORAGE TEMP: -30°C~80°C
5. BACKLIGHT:6-CHIP LEDs Serial
6. ▽:CRITICAL DIMENSION, ():REFERENCE DIMENSION
7. MEASURING UP THE ROHS RULES
8. 建议客户机壳开窗单边比TPVA单边小0.3mm, 机壳泡棉开窗比TPVA单边大0.6mm

4. Interface signals

Table 2: Pin assignment

Pin No.	Symbol	Description
1-2	LED_K	Power supply for LED backlight
3-4	LED_A	
5	GND	Power supply (system ground)
6	XR	Terminal of touch panel.
7	YD	
8	XL	
9	YU	
10	GND	Power supply (system ground)
11-13	NC	No connection
14	RESET	System reset pin
15	CS	Chip select pin
16	SPCLK	Clock pin of serial interface
17	SDA-SDI	Data pin of serial interface
18-19	NC	No connection
20-25	B[0-5]	Blue data 6-bit/18bit bi-directional (D0-D5)
26-27	NC	No connection
28-33	G[0-5]	Green data 6-bit/18bit bi-directional (D6-D11)
34-35	NC	No connection
36-41	R[0-5]	Red data 6-bit/18bit bi-directional (D12-D17)
42	HSYNC	Line synchronization signal input
43	VSYNC	Frame /Ram synchronization signal input
44	DCLK	Dot clock signal
45-46	AVDD	Supply voltage for lcd driving
47-48	VCC	Supply voltage for logic
49	DC	Parallel Interface
50	RD	I80 system: Serves as a read signal and reads data at the low level.
51	WR	I80 system: Serves as a write signal and writes data at the rising edge.

Pin No.	Symbol	Interface selection pin				
		PS3	PS2	PS1	PS0	Interface mode
52-55	PS[0:3]	0	0	1	0	16-bit 8080 parallel interface, D[17:10]&D[8:1]
		0	0	1	1	8-bit 8080 parallel interface, D[8:1]
		0	1	0	0	9-bit RGB(262 colour) + 3-wire SPI, D[8:0]
		0	1	0	1	16-bit RGB(262K colour) + 3-wire SPI, D[17:10]&D[8:1]
		0	1	1	0	18-bit RGB(262K colour) + 3-wire SPI, D[17:0]
		0	1	1	1	6-bit RGB(262K colour) + 3-wire SPI, D[8:3]
		1	0	1	0	18-bit 8080 parallel interface, D[17:0]
		1	0	1	1	9-bit 8080 parallel interface, D[8:0]
		1	1	1	0	3-wire SPI

Pin No.	Symbol	Description
56	WSYNC	Ram Write Synchronization output
57	NC	No connection
58	OE	Display enable pin from controller
59-60	GND	Power supply (system ground)

5. Absolute Maximum Ratings

5.1 Electrical Maximum Ratings – for IC Only

Table 3: Electrical Maximum Ratings – for IC

Parameter	Symbol	Min.	Max.	Unit	Note
Supply voltage	VCC	-0.3	+4.0	V	1
Input voltage	AVDD	-0.3	+5.0	V	

Note:

1.VCC, GND must be maintained.

2.The modules may be destroyed if they are used beyond the absolute maximum ratings.

5.2 Environmental Condition

Table 4

Item	Operating temperature (Topr)		Storage temperature (Tstg) (Note 1)		Remark
	Min.	Max.	Min.	Max.	
Ambient temperature	-20°C	+70°C	-30°C	+80°C	Dry
Humidity (Note 1)	80% max. RH for Ta $\leq$ 40°C < 50% RH for 40°C < Ta $\leq$ Maximum operating temperature				No condensation

Note 1: Product cannot sustain at extreme storage conditions for long time.

6. Electrical Specifications

Typical Electrical Characteristics

At Ta = 25 °C, VCC=IOVCC= 3.3V, GND=0V.

Table 5

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (logic)	VCC-GND		1.4	-	3.6	V
Supply voltage (lcd driving)	AVDD		2.5 or VDDIO	-	3.6	V
Output voltage(LCD)	VGH		9	-	18.0	V
	VGL		**-15.0**	-	-6	V
	VCOM		**-1**	-	6	V
Supply current (Logic & LCD)	ICC	VDD=2.2V	-	-	10	mA
Supply voltage of white LED backlight	VLED	Forward current =20 mA	-	19.2	21.6	V
Luminance (on the module surface)		Number of LED dies = 6	150	-	-	cd/m^2

7. Optical Characteristics

Table 7: Optical specifications

Items		Symbol	Condition	Specifications Min.	Specifications Typ.	Specifications Max.	Unit	
Contrast Ratio		CR		200	300	-	-	
Response Time		T_R		-	15	30	ms	
		T_F		-	35	50	ms	
Chromaticity	Red	X_R		0.609	0.639	0.669	-	Note
		Y_R		0.314	0.344	0.374	-	
	Green	X_G		0.264	0.294	0.324	-	
		Y_G		0.557	0.587	0.617	-	
	Blue	X_B		0.102	0.132	0.162	-	
		Y_B		0.106	0.136	0.166	-	
	White	X_W		0.282	0.312	0.342	-	
		Y_W		0.319	0.349	0.379	-	
Viewing angle	Hor.	$\phi1$(3 o'clock)	Center CR≥10	-	45	-	deg.	
		$\phi2$(9 o'clock)		-	45	-		
	Ver.	$\theta2$(12 o'clock)		-	15	-		
		$\theta1$(6 o'clock)		-	35	-		
NTSC ratio					61.5		%	

Note 1: Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

L63: Luminance of gray level 63

L0: Luminance of gray level 0

CR = CR (10)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note 5.
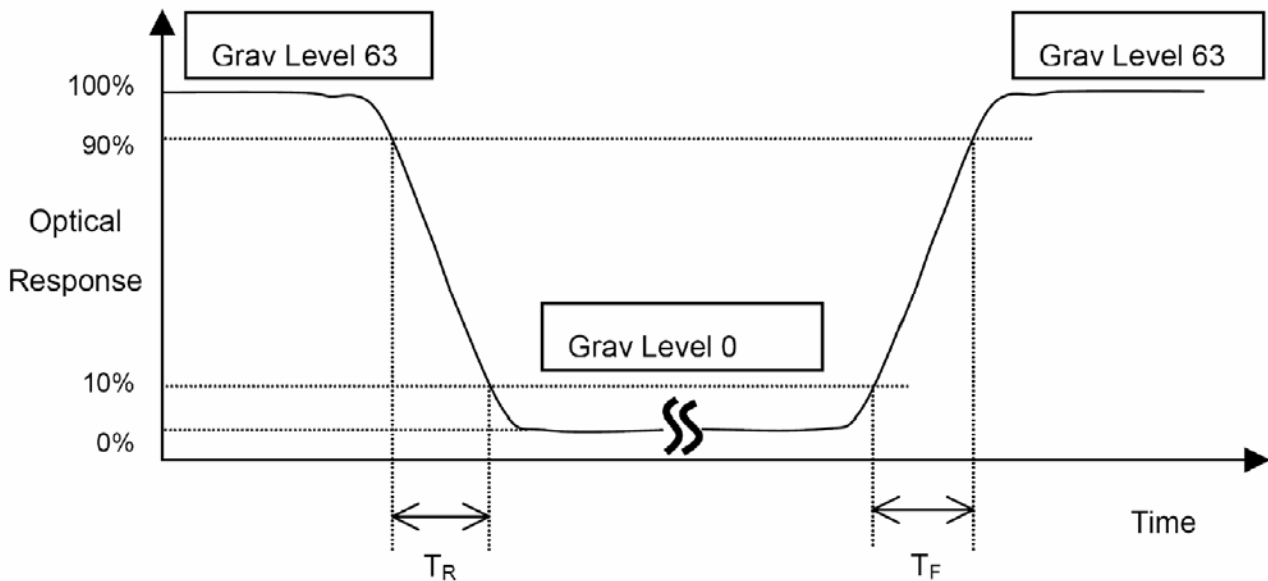
Note 2: Definition of Response Time (TR, TF):

Figure 3

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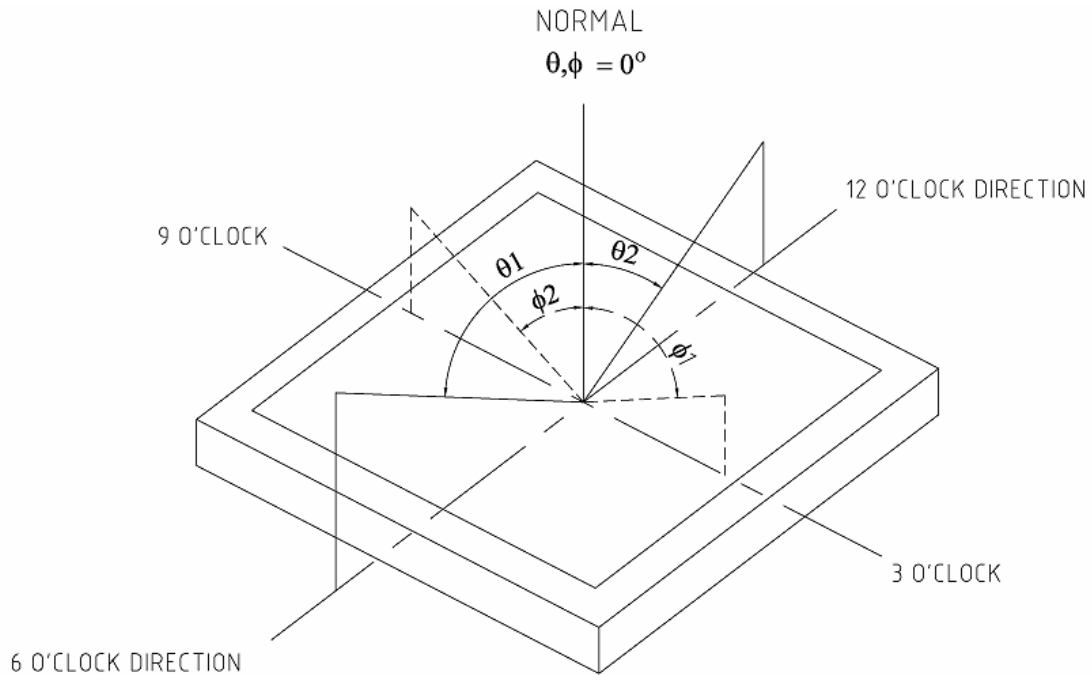
Note 3: Viewing Angle

Figure 4

The above "Viewing Angle" is the measuring position with Largest Contrast Ratio; not for good image quality. View Direction for good image quality is 6 O'clock. Module maker can increase the "Viewing Angle" by applying Wide View Film.

Note 4: Measurement Set-Up:
The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.

Figure 5

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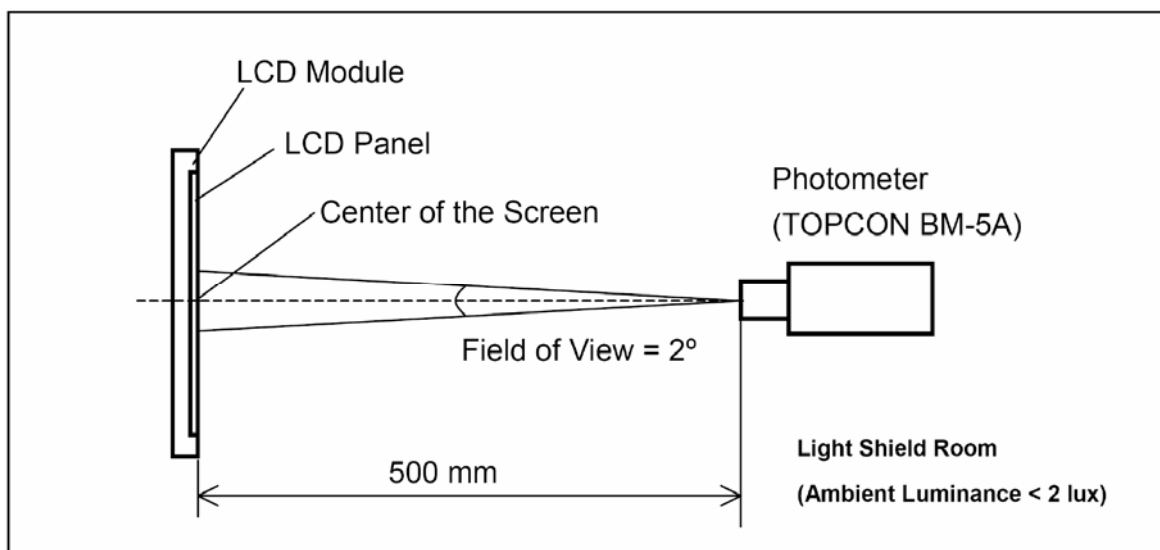
8. AC Characteristics

8.1 Parallel 8080 Timing Characteristics

$(T_A = -20$ to $70°C$, $V_{DDIO} = 1.65V$ to $3.6V)$

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time (write cycle)	100	-	-	ns
t_{cycle}	Clock Cycle Time (read cycle)	1000	-	-	ns
t_{AS}	Address Setup Time	0	-	-	ns
t_{AH}	Address Hold Time	0	-	-	ns
t_{DSW}	Data Setup Time	5	-	-	ns
t_{DHW}	Data Hold Time	5	-	-	ns
t_{ACC}	Data Access Time	250	-	-	ns
t_{OH}	Output Hold time	100	-	-	ns
$PWCS_L$	Pulse Width /CS low (write cycle)	50	-	-	ns
$PWCS_H$	Pulse Width /CS high (write cycle)	50	-	-	ns
$PWCS_L$	Pulse Width /CS low (read cycle)	500	-	-	ns
$PWCS_H$	Pulse Width /CS high (read cycle)	500	-	-	ns
t_R	Rise time	-	-	4	ns
t_F	Fall time	-	-	4	ns

Write Cycle
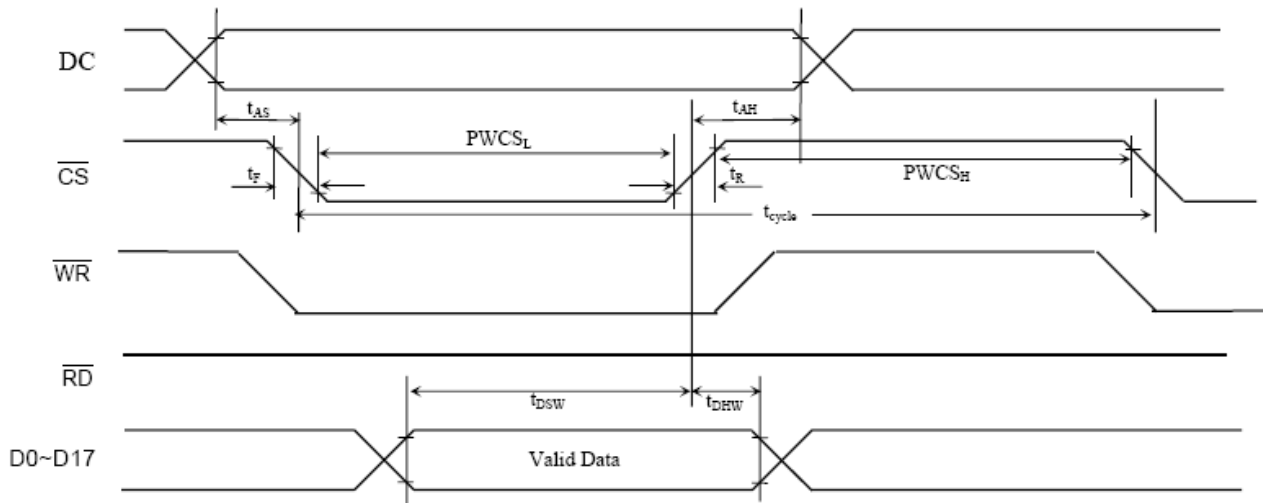
Read Cycle
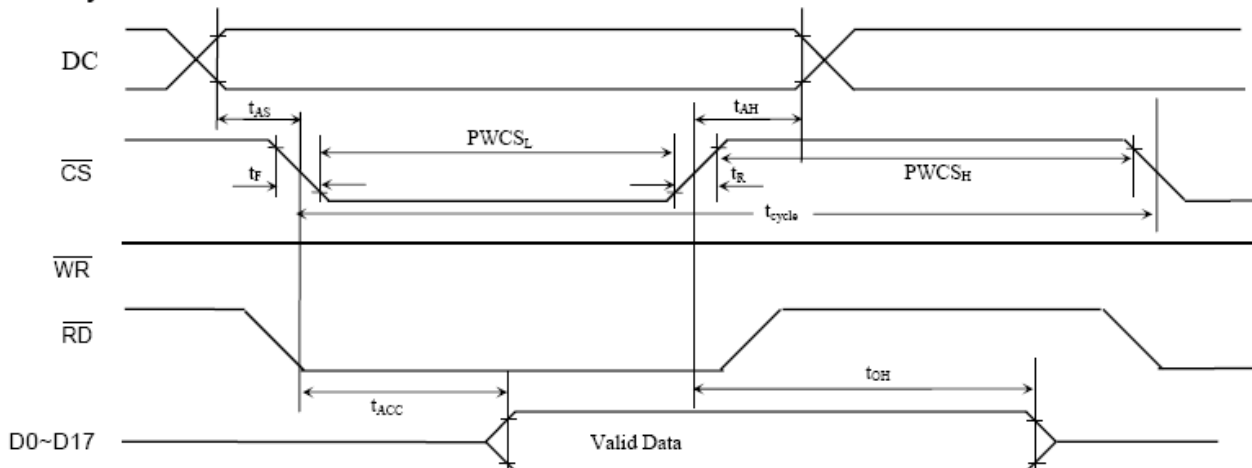
9. Reliability Test Item

Test Item	Sample Type	Test Condition	Test result determinant gist
High temperature storage	Normal temperature	70±3℃;96H	the inspection of appearance and function character.
	Wide temperature	80±3℃;96H	
Low temperature storage	Normal temperature	-20±3℃;120H	
	Wide temperature	-30±3℃;120H	
High temperature /humidity storage	Normal temperature	50℃±3℃,90%±3%RH;96H	
	Wide temperature	60℃±3℃,90%±3%RH;96H	
High temperature operation	Normal temperature	60±3℃;96H	no objection of the function character; no fatal objection of the appearance.
	Wide temperature	70±3℃;96H	
Low temperature operation	Normal temperature	0±3℃;96H	
	Wide temperature	-20±3℃;96H	
High temperature /humidity operation	Normal temperature	40℃±3℃,90%±3%RH;96H	
	Wide temperature	50℃±3℃,90%±3%RH;96H	
Temperature Shock	Normal temperature	-20±3℃,30min→70±3℃,30 min;10cycle	inspect the objections appearance、 function & the whole structure
	Wide temperature	-30±3℃,30min 80±3,30min;10cycle	The inspection of appearance、 function & the whole structure

10. Suggestions for using LCD modules

10.1 Handling of LCM

1. The LCD screen is made of glass. Don't give excessive external shock, or drop from a high place.

2. If the LCD screen is damaged and the liquid crystal leaks out, do not lick and swallow. When the liquid is attach to your hand, skin, cloth etc, wash it off by using soap and water thoroughly and immediately.

3. Don't apply excessive force on the surface of the LCM.

4. If the surface is contaminated ,clean it with soft cloth. If the LCM is severely contaminated , use Isopropyl alcohol/Ethyl alcohol to clean. Other solvents may damage the polarizer . The following solvents is especially prohibited: water , ketone Aromatic solvents etc.

5. Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

6. Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

7. Don't disassemble the LCM.

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

   - Be sure to ground the body when handling the LCD modules.

   - Tools required for assembling, such as soldering irons, must be properly grounded.

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

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

9. Do not alter, modify or change the the shape of the tab on the metal frame.

10. Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

11. Do not damage or modify the pattern writing on the printed circuit board.

12. Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector

13. Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

14. Do not drop, bend or twist LCM.

10.2 Cautions for installing and assemabling if the module has Touch Panel

1. Use a buffer material (Gasket) between the touch panel and Front-case to protect damage and wrong operating. The dimension of the buffer material's edge between the TP V.A. edge is Min. 0.3mm.

2. We recommend to design a case that it can't over the boundary of the active area Max. 0.5mm in order to prevent an operation at outside of the active area which can't guarantee the specified durability, because operation at the outside of the active area cause serious damage of a transparent.

3. When design case for installing Module, you would consider give a distance about 0.2 ± 0.15mm between the module edge to case inside.

4. The corners of the product are not chamfered. When positioning and fixing the product on the case, we sugguest that you would provide a R part on the conner of the case so as not to apply load on the corner of the transparent module.
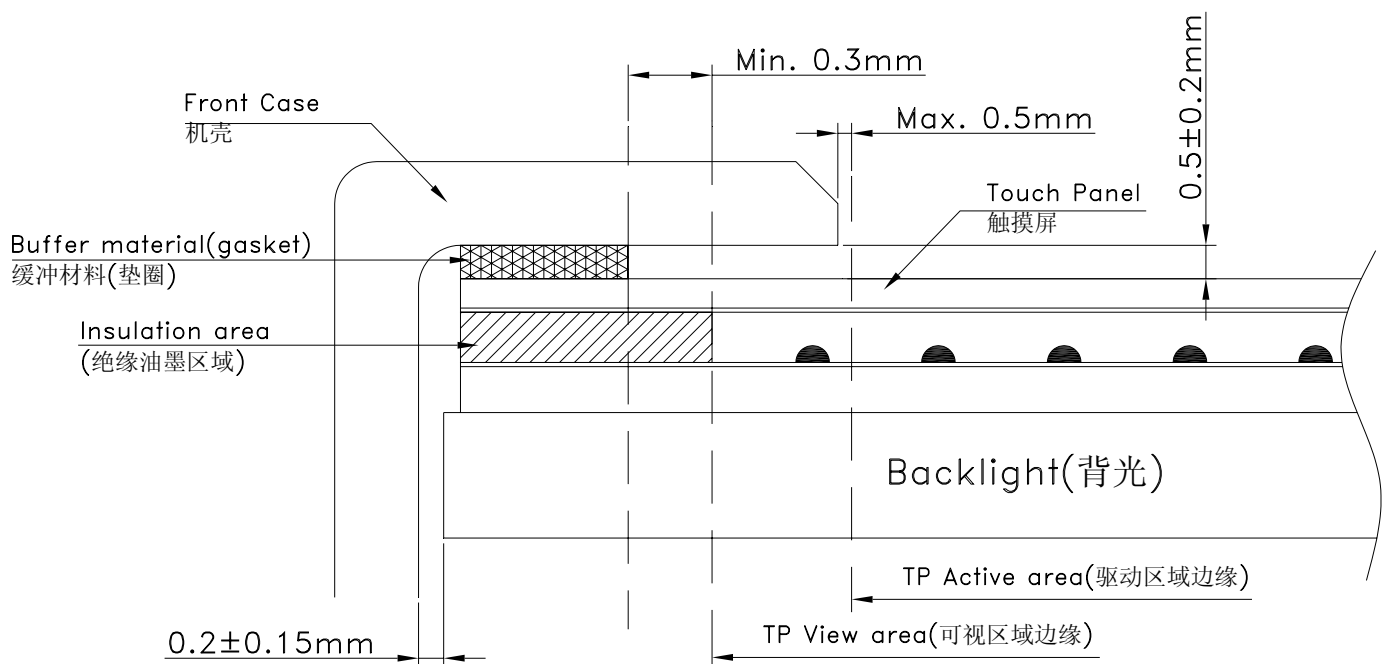
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10.3 Storage

1. Store in an ambient temperature of 5 to 45 °C, and in a relative humidity of 40% to 60%. Don't expose

   to sunlight or fluorescent light.

2. Storage in a clean environment, free from dust, active gas, and solvent.

3. Store in antistatic container.

11. Inspection Standard

This specification is made to be used as the standard acceptance/rejection criteria for Color mobile phone LCM with touch pannel.

11.1 Sample plan and Inspection condition

11.1.1 Sample plan

Sampling plan according to MIL-STD-105E , normal level 2 and based on:

Major defect: AQL 0.65;

Minor defect: AQL 1.5.

11.1.2 Inspection condition

Viewing distance for cosmetic inspection is about 30cm with bare eyes, and under an environment of 20~40W light intensity, all directions for inspecting the sample should be within 45 against perpendicular line.

11.2 Definition of inspection zone in LCD
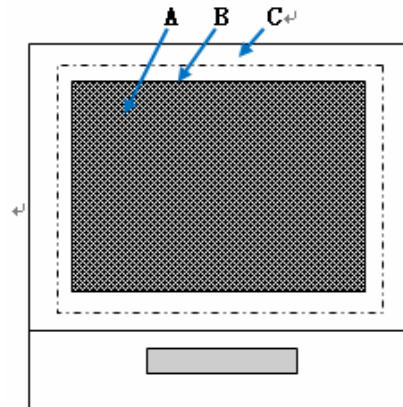
Inspection zones in an LCD

Zone A: character/Digit area;

Zone B: viewing area except Zone A (ZoneA+ZoneB=minimum Viewing area);

Zone C: Outside viewing area (invisible area after assembly in customer's product);

Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product. Defects are classified as major defects and minor defects according to the degree of defectiveness defined herein.

11.3 Major defects and Minor defects

11.3.1 Major defects

A major defect is a defect that is likely to result in failure, or to reduce the usability of the product for its intended purpose.

11.3.1.1 Abnormal operation: modules cannot display normally;

11.3.1.2 Line defect;

11.3.1.3 There is serious distortion or sharp burr on mechanical housing;

11.3.1.4 Glass breakage.

11.3.2 Minor defects:

  A minor defect is a defect that is not likely to reduce the usability of the product for its intended purpose.

  11.3.2.1 Dot defect:

   11.3.2.1.1 Inspection pattern : Full white, full black, red, green and blue screens;

   11.3.2.1.2 Criteria :(acceptable);
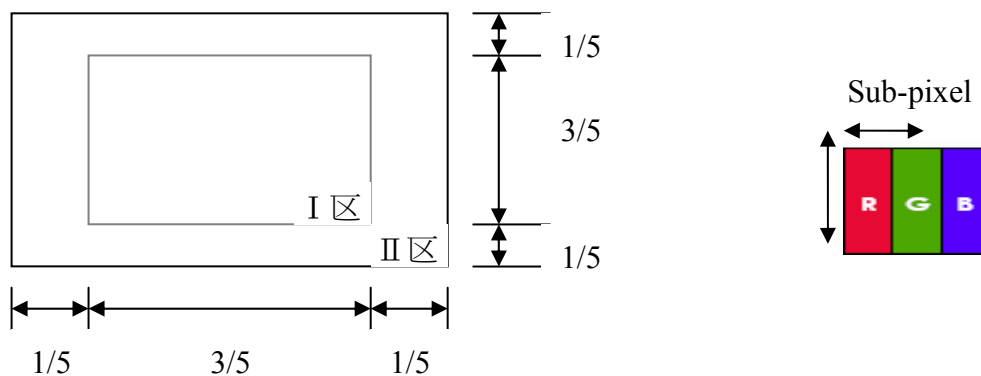
  Note: 1. Dot defect is defined as the defective area of the dot area is larger than 50% of the dot area .
       And the bright dot defect must be visible through 5% ND filter.
       2. Except for the allowed numbers of adjacent dots, the distance between dot defects should be
       more than 3mm apart.

   11.3.2.1.3 The definitions of the inner display area and outer display area.

11.4 Inspection standards table:

11.4.1 Major defect

Item No.	Items to be	Inspection Standard	Classification of defects
11.4.1.1	All functional defects	1) No display 2) Display abnormally 3) Missing vertical/horizontal segment 4) Short circuit 5) Back-light no lighting, flickering and abnormal lighting.	Major
11.4.1.2	Missing	Missing component	
11.4.1.3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	
11.4.1.4	linearity	No more than 1.5%	
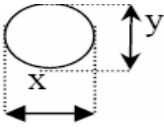
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11.4.2 Cosmetic Defect (spot defect)

Item No	Itemsto be	Inspection Standard				Classification of defects
11.4.2.1	**Clear Spots** Black and white Spot defect Pinhole, Foreign Particle, polarizer Dirt	For dark/white spot, sizeΦis defined as Φ=(x +y)/2				Minor

For item 11.4.2.1:

Zone Size(mm)	Acceptable Qty			Classification
	A	B	C	
Φ≤0.1	Ignore		Ignore	Minor
0.10＜Φ≤0.15	2			
0.15＜Φ≤0.20	1			
Φ＞0.20	0			

11.4.2.2	**Clear Spots** TP Dirt	Zone Size(mm)	A	B	C	Minor
		Φ≤0.1	Ignore		Ignore	
		0.10＜Φ≤0.15	2			
		0.15＜Φ≤0.25	1			
		Φ＞0.25	0			

11.4.2.3	**Dim Spots** Circle shaped and dim edged defects	Zone Size(mm)	A	B	C	Minor
		Φ≤0.2	Ignore		Ignore	
		0.20＜Φ≤0.4	2			
		0.4＜Φ≤0.6	1			
		Φ＞0.6	0			

11.4.2.4	**Dot defect**	dot =sub-pixel	Acceptable Qty		Minor
			I	II	
		Bright dot	0	2	
		Dark dot	1	2	

The distance of two point ＞5mm

11.4.3 Cosmetic Defect (linear defect)

Item No	Items to be	Inspection Standard					Classification of defects
11.4.3.1	**Line defect** Black line, White line, Foreign material on polarizer	Size(mm)		Acceptable Qty			Minor
		L(Length)	W(Width)	zone			
				A	B	C	
		Ignore	W≤0.02	Ignore		Ignore	
		L≤3.0	0.02＜W≤0.03	2			
		L≤2.0	0.03＜W≤0.05	1			
			W＞0.05	Define as spot defect			

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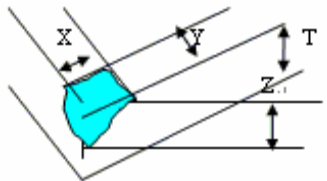
| 11.4.3.2 | Foreign Material on TP film | The line can be seen after mobile phone in the operating condition: | | | | | | Minor |

The line can be seen after mobile phone in the operating condition:

Size(mm)		Acceptable Qty			
L(Length)	W(Width)	zone			
		A	B	C	
Ignore	W≤0.03	Ignore			
L≤3.0	0.03＜W≤0.05	3		Ignore	
	W＞0.05	Define as spot defect			

11.4.3.2 — Foreign Material on TP film — Minor

11.4.3.3 — **Dim line defect** Polarizer &BL scratch TP film scratch

If the scratch can be seen after mobile phone cover assembling or in the operating condition, judge by the line defect of 11.4.3.1. If the scratch can be seen only in non-operating condition or some special angle, judge by the following.

Size(mm)		Acceptable Qty			
L(Length)	W(Width)	zone			
		A	B	C	
Ignore	W≤0.02	Ignore			
L≤3.0	0.02＜W≤0.03	2		Ignore	
L≤2.0	0.03＜W≤0.05	1			
	W＞0.05	Define as spot defect			

Minor

11.4.3.4 — Polarize Air bubble

Air bubbles between glass & polarizer

	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		
0.20＜Φ≤0.3	2		Ignore
0.3＜Φ≤0.5	1		
Φ＞0.5	0		

Minor

11.4.4 Chipping Defect

Item No	Items to be	Inspection Standard	Classification of defects
11.4.4.1	Glass defect	Chips on corner **A:LCD Glass defect** <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤0.2</td><td>≤S</td><td>Disregard</td></tr></table> Notes: S=contact pad length Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal. **B:TP Glass defect** <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0</td><td>≤3.0</td><td>Disregard</td></tr></table>	Minor

Usual surface cracks

A:LCD Glass defect
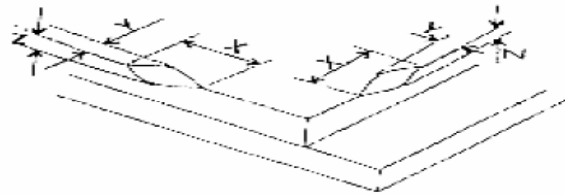
X	Y	Z
≤3.0	<Inner border line of the seal	Disregard

B:TP Glass defect
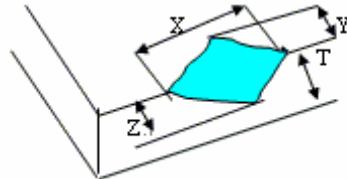
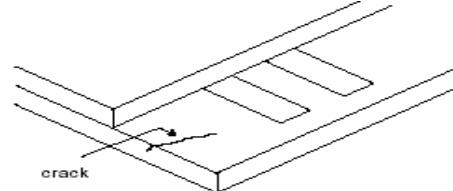| X	Y	Z
≤6.0	≤2.0	Disregard

Crack: Cracks tend to break are not allowed.

11.4.5 Parts Defect

| Item No	Items to be	Inspection Standard	Classification of defects
11.4.5.1	Parts contra position	1、Not allow IC and FPC/heat-seal lead width is more than 50% beyond lead pattern. 2、Not allow chip or solder component is off center more than 50% of the pad outline.	Major
11.4.5.2	SMT	According to the <Acceptability of electronic assemblies>IPC-A-610C class 2 standard. Component missing or function defect are Major defect, the others are Minor defect.	Major
11.4.5.3	TP Defect	1、 Pattern font： Pattern fonts are clear and symmetrical， pattern fonts filter lightly are allowed; The fort line is not allow to thinner or thicker than 1/3 of normal size, and swing is not more than 0.1mm. the line is smooth and not broken. 图案字体　Pattern font 2、The wing forward in the side of Visual Area： The length of wing forward inside of the Visual Area: n≤0.2mm；Not excess 3 point，and the distance D≥20mm。	Major
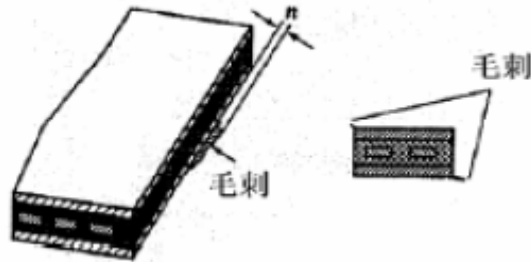
3、Film impression: With operation, must be invisibility.
4、Touch panel knob：if writing function normally, it could be allowed.

TP鼓　　TP knob

5、 Newton ring
Without operation, the color circle of Regularity or
Non-regularity from the normal or slope angle of view.
1、Regularity： The area of the newton ring is less than 1/3 area of the touch panel; and no character affected and line distorted after touch panel lightening. It's ok.
2、 Non-regularity ： The area of the Newton ring is less than the 1/2 area of touch panel with lightening. And no character affected and line
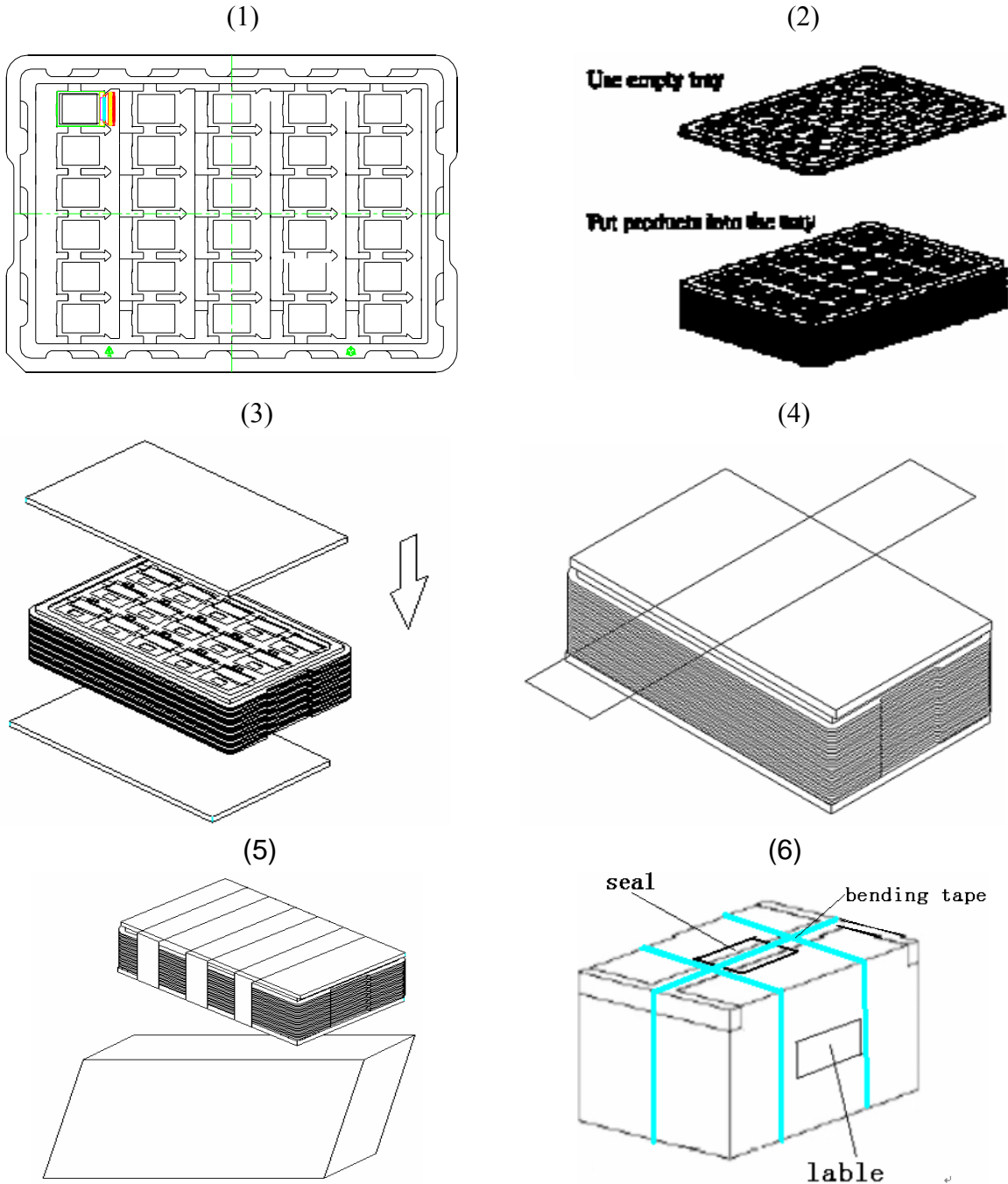
规律形　　　　　　非规律形

11.4.5.4	Backlight elements	1 Illumination source flickers when lit. 2 Spots or scratches that appear when lit must be judged using LCD spot, lines and contamination standards. 3 Backlight doesn't light or color is wrong	Major
11.4.5.5	Soldering	1 No unmelted solder paste may be present on the FPC 2 No cold solder joints, missing solder connections, oxidation or icicle. 3 No short circuits in components on FPC	Major

KITRONIX

12. Packing (Reference only)
Packing Method

(1)

(2)

Use empty tray

Put products into the tray

(3)

(4)

(5)

(6)

seal

bending tape

lable

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.

- END -