优奕视界® 深圳市优奕视界有限公司
SHEN ZHEN VIEWE TECHNOLOGY CO., LTD

LCD MODULE
SPECIFICATION

Model:	LCM-UE021WV-RB40-L008A
Version:	V1.0
Date:	20230321

Customer Confirmation 客户确认

Approved by	Notes

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VIEWE Confirmation 优奕确认

Prepared by	Reviewed by	Approved by

REVISION HISTORY

Revision 版本号	Date 日期	Contents of Revision Change 修改内容	Remark 备注
V1.0	2023.03.21	Preliminary release	

TABLE of CONTENTS

1. GENERAL INFORMATION

1.1 Features

1) Pixel Arrangement：RGB Vertical Stripe
2) Interface Mode：3SPI-RGB 24bits
3) Driver IC： ST7701S or Equivalent
4) Operation Temperature：-20~70℃
5) Storage Temperature：-30~80℃
6) Backlight Type：White LED
7) Display mode： Normally Black
8) Pixel Density：323 PPI
9) LED life time：30,000 Hours

1.2 Mechanical Specification

Item 项目	Specification 规格	Unit 单位	Remark 备注
Pixel Driving element	IPS TFT	-	-
Screen Size	2.1	Inch	Diagonal
Resolution	480(W)*3(RGB)*480(H)	Dots	-
Interface	3 Wire SPI + RGB 24bits	-	-
Module Power Consumption	0.405	Watt	Typ.
Active Area	53.28(W)*53.28(H)	mm	-
Pixel pitch (W*H)	111(W)*111(H)	um	-
Module Size (W*H*D)	56.18(W)*59.71(H)*2.2(D)	mm	-
Luminance	360	cd/m^2	Typ.
Viewing Direction	All	O'clock	-
Display Color	16.7M	Colors	24 Bits

2. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit	Note
Power Supply voltage 1	VCI~GND	-0.3	+4.6	V	
Power Supply voltage 2	IOVCC~GND	-0.3	+4.6	V	
Logic Input Voltage Range	VIN	-0.3	IOVCC+0.5	V	
Logic Output Voltage Range	VO	-0.3	IOVCC+0.5	V	
Operating temperature	Topr	-20	+70	C	
Storage temperature	Tstg	-30	+80	C	

* The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings   exceeded, the characteristics of the module may not be recovered, or in an extreme   case, the module may be permanently destroyed.

3. DC ELECTRICAL CHARACTERISTICS

3.1 Driving TFT LCD Panel

AGND = GND = 0V, Ta = 25C

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage for analog circuit	VCI	2.5	2.8	3.6	V
Supply voltage for logic circuit	IOVCC	1.65	1.8	3.3	V
Input voltage ′H′level	VIH	0.7*IOVCC	—	IOVCC	V
Input voltage ′L′level	VIL	GND	—	0.3*IOVCC	V
Output voltage ′H′level	VOH	0.8*IOVCC	—	IOVCC	V
Output voltage ′L′level	VOL	GND	—	0.2*IOVCC	V

3.2 Backlight Characteristics

Ta = 25C

Item	Symbol	Min	Typ	Max	Unit	Condition
ForwardvoltageVfV			6	6.6	V	If=80 mA
Luminance	LV	6000	-	—	cd/m	
Number of LED	-		1X4		Piece	-
Connection mode	S/P		1Serial/4Parallel		-	-

Using condition: constant current driving method If= 4×20mA (+/- 10%)

4. TIMING CHARACTERISTICS
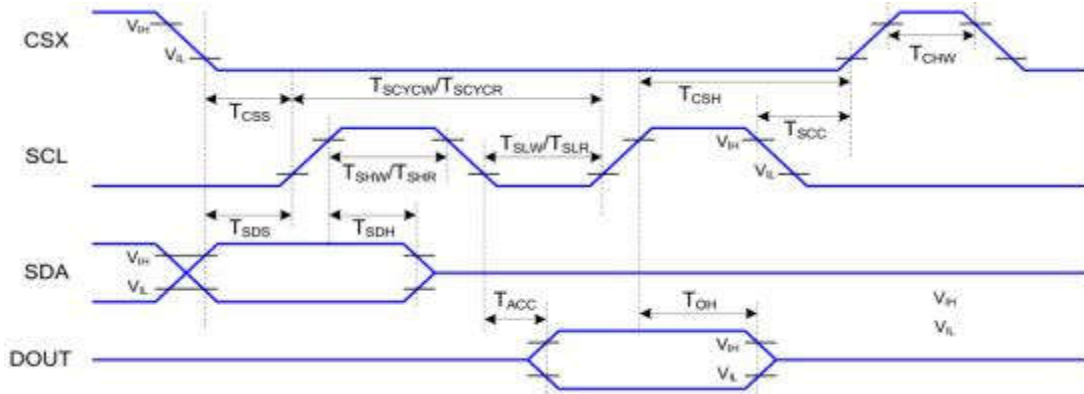
4.1 Serial Interface Characteristics(3-line serial)

Figure 4. 1   3-line serial Interface Timing Characteristics

Ta=25C, IOVCC=1.65~3.7V, VCC=2.5~3.7V

Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	TCSS	Chip select setup time(write)	15	-	ns	
	TCSH	Chip select hold time(write)	15	-	ns	
	TCSS	Chip select setup time(read)	60	-	ns	
	TSCC	Chip Select hold time(read)	60	-	ns	
	TCHW	Chip Select 'H' pulse width	40	-	ns	
SCL	TSCYCW	Serial clock cycle(write)	66	-	ns	Write Command & Data Ram
	TSHW	SCL 'H' pulse width(write)	15	-	ns	
	TSLW	SCL 'L' pulse width(write)	15	-	ns	
	TSCYCR	Serial clock cycle(read)	150	-	ns	Read Command & Data Ram
	TSHR	SCL 'H' pulse width(read)	60	-	ns	
	TSLR	SCL 'L' pulse width(read)	60	-	ns	
SDA (DIN)	TSDS	Data setup time	10	-	ns	
	TSDH	Data hold time	10	-	ns	

Note : The rising time and falling time (Tr, Tf) of input signal are specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of IOVCCfor Input signals.

Table 4.1 3-line Serial Interface Characteristics
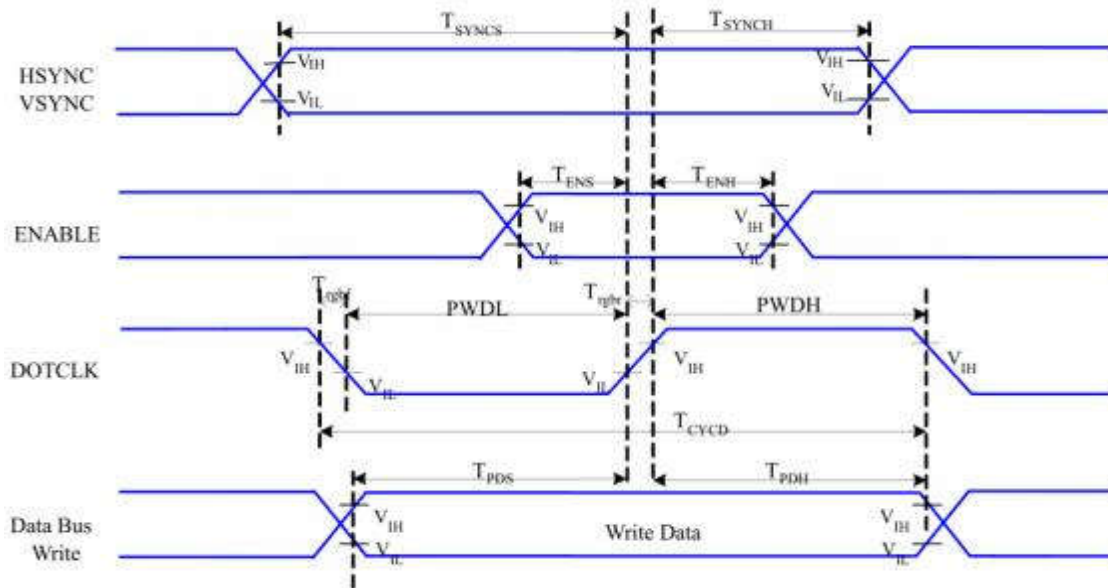
4.2 RGB Interface Characteristics

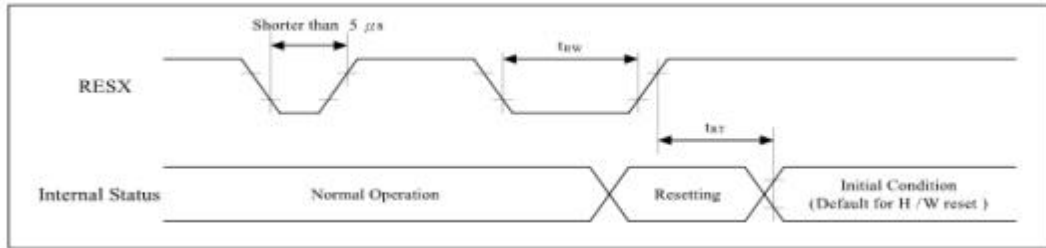**Figure 4.2. 1   RGB Interface Timing Characteristics**

Ta=25C, IOVCC=1.8V, VCC=2.8V

Signal	Symbol	Parameter	Min	Max	Unit	Description
HSYNC, VSYNC	TSYNCS	VSYNC,HSYNV Setup Time	5	-	ns	
ENABLE	TENS	Enable setup time	5	-	ns	
	TENH	Enable hold time	5	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	15	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	15	-	ns	
	TCYCD	DOTCLK Cycle Time	33	-	ns	
	Trghr, Trghf	DOTCLK Rise/Fall time.	-	15	ns	
DB	TPDS	PD Data Setup Time	5	-	ns	
	TPDH	PD Data Hold Time	5	-	ns	

Table 4.2.2 18/16 Bits RGB Interface Timing Characteristics

5. Reset Timing

Signal	Symbol	Parameter	Min.	Max.	Unit
RESX	t_{RW}	Reset pulse duration	10(Note)	-	us
	t_{RT}	Reset cancel	-	10(Note)	ms
			-	120(Note)	ms

Notes:

1. The reset cancel also includes required time for loading ID bytes, VCOM setting and other settings from

   EEPROM (or similar device) to registers.

This loading is done every time when there is HW reset cancel time (tRT) within 10 ms after a rising edge of
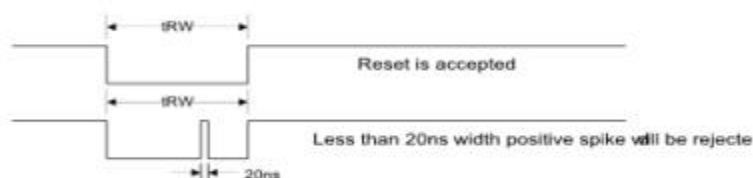
   RESX.

2. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table

   below ：

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset starts

3. During the Resetting period, the display will be blanked(The display is entering blanking sequence, which

   maximum time is 120 ms, when Reset

Starts at Sleep-Out status. The display remains the blank state in Sleep-In mode). Then return to Default condition

   for Hardware Reset

4. Spike Rejection also applies during a valid reset pulse as shown below ：
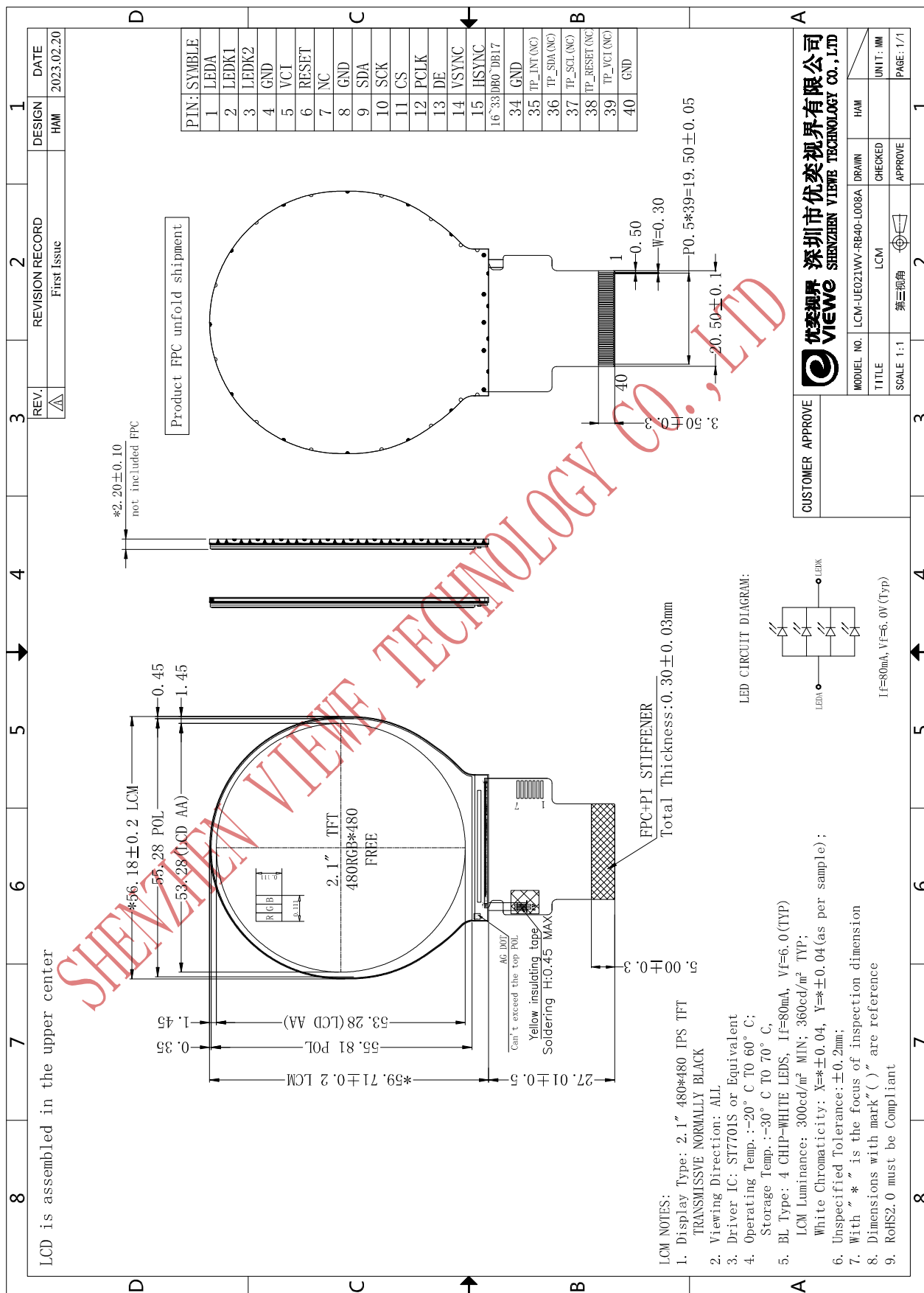

5. When Reset applied during Sleep-In Mode.

6. When Reset applied during Sleep-Out Mode

7. It is necessary to wait 10ms after releasing RESX before sending commands. Also Sleep Out

command cannot be sent for 120 ms.

6. EXTERNAL DIMENSIONS

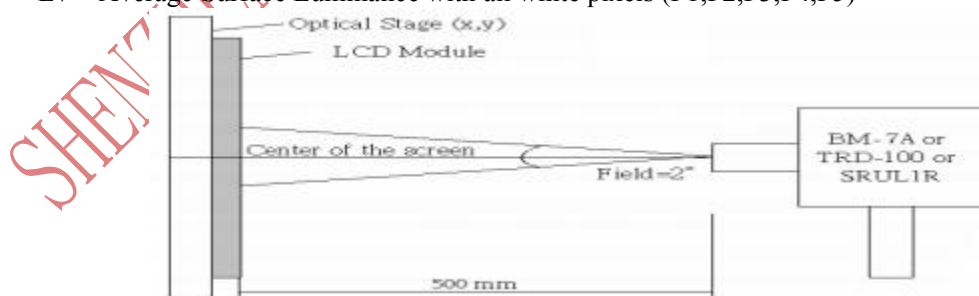| PIN	SYMBLE
1	LEDA
2	LEDK1
3	LEDK2
4	GND
5	VCI
6	RESET
7	NC
8	GND
9	SDA
10	SCK
11	CS
12	PCLK
13	DE
14	VSYNC
15	HSYNC
16~33	DB0~DB17
34	GND
35	TP_INT(NC)
36	TP_SDA(NC)
37	TP_SCL(NC)
38	TP_RESET(NC)
39	TP_VCI(NC)
40	GND

Product FPC unfold shipment

*2.20±0.10 not included FPC

P0.5*39=19.50±0.05
0.50
W=0.30
1
20.50±0.1
40
3.50±0.3

MODUL. NO. LCM-UE021WV-RB40-L008A
TITLE LCM
SCALE 1:1 第三视角 第三视角
DRAWN HAM
CHECKED
APPROVE
UNIT: MM
PAGE: 1/1
深圳市优奕视界有限公司
SHENZHEN VIEWE TECHNOLOGY CO., LTD

CUSTOMER APPROVE

LED CIRCUIT DIAGRAM:
LEDK
LEDA
If=80mA, Vf=6.0V(Typ)

FPC+PI STIFFENER
Total Thickness:0.30±0.03mm

LCD is assembled in the upper center

0.45
1.45
*56.18±0.2 LCM
55.28 POL
53.28(LCD AA)

2.1" TFT
480RGB*480
FREE

R G B

AG DOT
Can't exceed the top POL
Yellow insulating tape
Soldering H:0.45 MAX

5.00±0.3

1.45
53.28 (LCD AA)
0.35
55.81 POL
27.01±0.5
*59.71±0.2 LCM

LCM NOTES:
1. Display Type: 2.1" 480*480 IPS TFT
   TRANSMISSVE NORMALLY BLACK
2. Viewing Direction: ALL.
3. Driver IC: ST7701S or Equivalent
4. Operating Temp.:-20°C TO 60°C;
   Storage Temp.:-30°C TO 70°C,
5. BL Type: 4 CHIP-WHITE LEDS, If=80mA, Vf=6.0(TYP)
   LCM Luminance: 300cd/m² MIN; 360cd/m² TYP;
   White Chromaticity: X=*±0.04, Y=*±0.04(as per sample);
6. Unspecified Tolerance:±0.2mm;
7. With "*" is the focus of inspection dimension
8. Dimensions with mark"( )" are reference
9. RoHS2.0 must be Compliant

7.INTERFACE SIGNAL

Pin No.	Symbol	Description
1	LEDA	LED backlight anode
2	LEDK1	LED backlight cathode
3	LEDK2	LED backlight cathode
4	GND	Power ground
5	VCI	Analog power supply
6	RESET	Reset signal(low active)
7	IOVCC	Power supply for the logic power and I/O circuit.
8	GND	Power ground
9	SDA	Serial data input pin in serial bus system interface
10	SCK	Pixel clock signal input pin
11	CS	Chip select
12	PCLK	Pixel clock signal in RGB interface
13	DE	Data enable signal in RGB I/F mode
14	VSYNC	Vertical synchronizing signal input pin
15	HSYNC	Horizontal synchronizing signal input pin
16-33	DB0-DB17	Data bus
34	GND	Power ground
35	TP_INT	INT pin for CTP
36	TP_SDA	SDA pin for CTP
37	TP_SCL	SCL pin for CTP
38	TP_RESET	Reset pin for CTP
39	TP_VCI	Power supply for CTP
40	GND	Power ground

8.ELECTRO-OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Transmittance (w/o polarizer)		T%	θ=0° Ta=25C	-	4	-	%	1
Contrast ratio		Cr		800	1000	-	-	3
Response time		Ton+Toff		-	30	35	ms	4
Surface Luminance		LV		--	360	-	cd/m	2
Viewing angle range	H or V er	$\Theta x+$	Center CR>10	-	85	-	deg	5
		$\Theta x-$		-	85	-	deg	
		$\Theta Y+$		-	85	-	deg	
		$\Theta Y-$		-	85	-	deg	
CIE(x,y) chromaticity	Red	x	Viewing normal angle $\Theta x=\theta y=0°$ Ta=25C	0.591	0.621	0.651	-	6
		y		0.320	0.350	0.380	-	
	Green	x		0.294	0.324	0.354	-	
		y		0.609	0.639	0.669	-	
	Blue	x		0.114	0.144	0.174	-	
		y		0.034	0.064	0.094	-	
	White	x		0.250	0.280	0.310	-	
		y		0.295	0.325	0.355	-	

Note 1.Ambient condition：25℃±2℃ ， 60±10%RH ， under 10 Lunx in the darkroom。 Note 2.Measure device ： BM-7A (TOPCON) ， viewing cone=2°

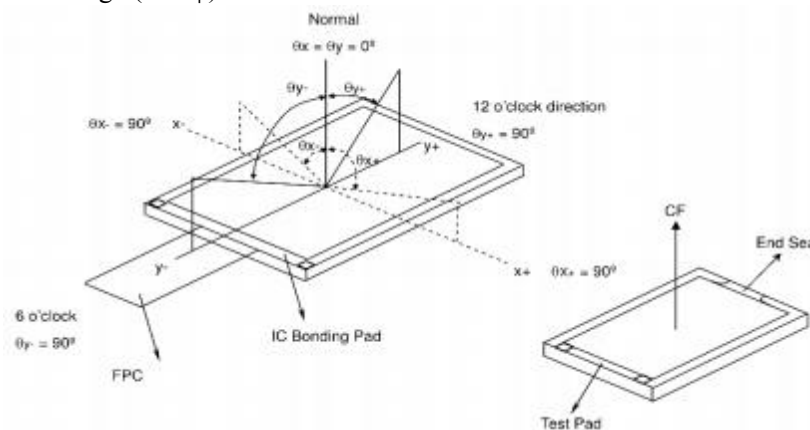　　Lv = Average Surface Luminance with all white pixels (P1,P2,P3,P4,P5)

Note 3. Definition of Contrast Ratio：

$$CR = \frac{\text{Average Surface Luminance with all black pixels (P1,P2,P3,P4,P5)}}{\text{Average Surface Luminance with all white pixels (P1,P2,P3,P4,P5)}}$$
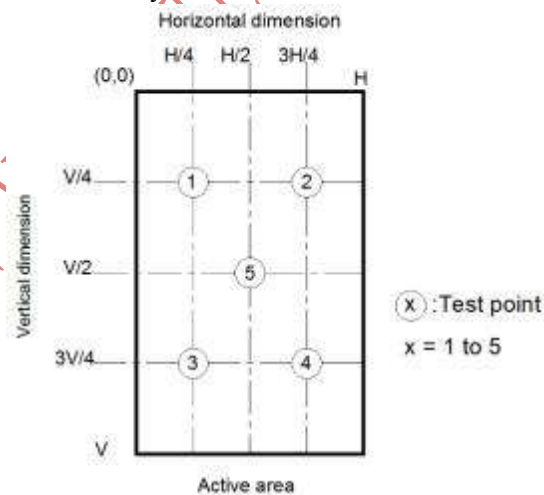
Note 4. Definition of Response Time (Ton, Toff), The response time is defined as the time interval between the 10% and 90% amplitudes.

Note 5. Definition of view angle(θ，ψ)：

Note 6. 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. Measouring method for Contrast ratio, surface luminance, Luminance uniformity,CIE(x,y)   chromaticity.

Light spot size □ =7mm, 500mm distance from the LCD surface to detector lens measurement instrument is TOPCON's luminance meter BM-7

9. RELIABILITY

Item 项目	Test Condition 测试条件	Remark 备注
High Temperature Storage	Ta =+70°C / 96Hours	Note1,2,3
Low Temperature Storage	Ta =-30°C / 96Hours	Note1,2,3
High Temperature Operating	Ta =+60°C / 96Hours	Note1,2,3
Low Temperature Operating	Ta =-20°C / 96Hours	Note1,2,3
Temperature Cycle storage Test	-30°C/30min Δ+70°C /30min for 30cycles,Transfer time less than 5min	Note2,3
Thermal humidity storage Test	80°C x 90%RH / 96Hours	Note2,3
Package Vibration Test	Frequency: 10Hz~55Hz,Amplitude:1.5mm, 1 hrs for each direction of X, Y, Z	Note2
Packing shock test	Drop to the ground from 60cm height, 1 corner, 3 edges, 6 surfaces.	Note2
ESD test	Contact: ±4KV Air: ±8KV	ESD

Inspection after Test:

Note1:Ta is the ambient temperature of samples.

Note 2: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but doesn't guarantee all the cosmetic specification.

Note 3: Before cosmetic and function tests, the product must have enough recovery time, at least 2 hours at room temperature.

10. INSPECTION CRITERION

This specification is made to be used as the standard acceptance/rejection criteria for Normal LCM Product.

1 Sample plan

Sampling plan according to GB/T2828. 1-2003/ISO 2859- 1：1999 and ANSI/ASQC Z1.4-1993,normal level 2 and based on:
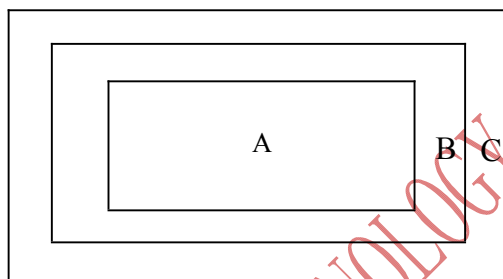
Major defect: AQL 0.65
Minor defect: AQL 1.0

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. (Normal temperature 20~25°C and normal humidity 60±15%RH).

3. Definition of inspection zone in LCD.

Zone A: character/Digit area

Zone B: viewing area except Zone A (Zone A + Zone B=minimum Viewing area)   Zone C: Outside

viewing area (invisible area after assembly in customer's product) Fig.1 Inspection zones in an LCD.
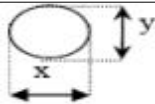
Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.
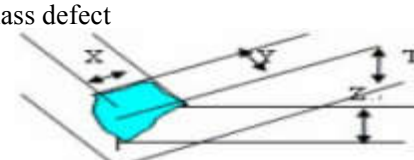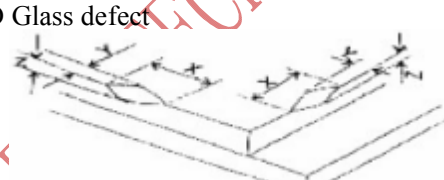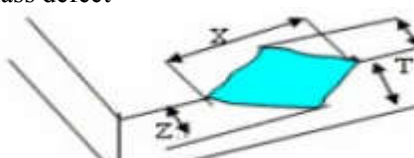
4.Standards of inspection items

4. 1 Major Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
4.1.1	All functional defects	1.No display	Major
		2.Display abnormally	
		3.Missing vertical，horizontal segment	
		4.Short circuit	
		5. Back-light no lighting, flickering and abnormal lighting	
4.1.2	Missing	Missing component	
4.1.3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	
4.1.4	linearity	No more than 1.5%	

4.2 Cosmetic Defect

Item No	Items to be inspected	Inspection Standard					Classification of defects
4.2.1	Clear Spots Black and white Spot defect Pinhole, Foreign Particle, polarizer Dirt	For dark/white spot, size Φ is defined as $\Phi=(x + y)/2$					Minor
		1					
		Zone / Size(mm)	Acceptable Qty				
			A	B	C		
		$\Phi \leq 0.15$	Ignore				
		$0.15 < \Phi \leq 0.20$	2		Ignore		
		$0.20 < \Phi \leq 0.30$	1				
		$\Phi > 0.30$	0				
	Clear Spots TP Dirt	**2**					Minor
		Zone / Size(mm)	Acceptable Qty				
			A	B	C		
		$\Phi \leq 0.15$	Ignore				
		$0.15 < \Phi \leq 0.20$	2		Ignore		
		$0.20 < \Phi \leq 0.30$	1				
		$\Phi > 0.30$	0				
	Dim Spots Circle shaped and dim edged defects	**3**					Minor
		Zone / Size(mm)	Acceptable Qty				
			A	B	C		
		$\Phi \leq 0.2$	Ignore				
		$0.20 < \Phi \leq 0.40$	2		Ignore		
		$0.40 < \Phi \leq 0.60$	1				
		$\Phi > 0.60$	0				

Item No	Items to be inspected	Inspection Standard					Classification of defects
4.2.2	Line defect Black line, White line,	Size(mm)		Acceptable Qty			Minor
		L(Length)	W(Width)	Zone			
				A	B	C	

	Foreign material on polarizer	Ignore	W≤0.05	Ignore	Ignore	
		L ≤5.0	0.05＜W≤0.08	2		
			W＞0.08	0		

		The line can be seen after mobile phone in the operating condition:				Minor
	Foreign material on TP film	Size(mm)		Acceptable Qty		
		L(Length)	W(Width)	Zone		
				A	B	C
		Ignore	W≤0.05	Ignore		Ignore
		L ≤5.0	0.05＜W≤0.08	3		
			W＞0.08	0		

4.2.3	Dim line defect Polarizer 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 4.2.2. If the scratch can be seen only in non-operating condition or some special angle, judge by the following.				Minor
		Size(mm)		Acceptable Qty		
		L(Length)	W(Width)	Zone		
				A	B	C
		Ignore	W≤0.03	Ignore		Ignore
		5.0＜L≤10.0	0.03＜W≤0.05	2		
		L≤5.0	0.05＜W≤0.08	1		
			W＞0.08	0		

4.2.4	Polarize Air bubble	Air bubbles between glass & polarizer				Minor
		Size(mm) / Zone	Acceptable Qty			
			A	B	C	
		Φ≤0.20	Ignore		Ignore	
		0.20＜Φ≤0.3	2			
		Φ＞0.30	0			

Item No	Items to be inspected	Inspection Standard			Classification of defects
4.35	Glass defect	(i) Chips on corner A:LCD Glass defect 			Minor
		X(mm)	Y(mm)	Z(mm)	
		≤3.0	≤3.0	Disregard	
		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 			
		X(mm)	Y(mm)	Z(mm)	
		≤3.0	≤3.0	Disregard	
		(ii)Usual surface cracks A:LCD Glass defect 			
		X(mm)	Y(mm)	Z(mm)	
		≤3.0	<Inner border line of the seal	Disregard	
		B:TP Glass defect 			
		X(mm)	Y(mm)	Z(mm)	
		≤6.0	<2.0	Disregard	
		(iii) Crack Cracks tend to break are not allowed. 			

11. PRECAUTIONS FOR USE OF LCD MODULES

1. Handling Precautions

(1) The display panel is made of glass and polarizer. As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.

(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).

(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents

   - Isopropyl alcohol
   - Ethyl alcohol

Do not scrub hard to avoid damaging the display surface.

(6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.

   - Water
   - Ketone
   - Aromatic solvents

Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.

(7) 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.

(8) 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 ⁄IO cable or the backlight cable.

(9) Do not attempt to disassemble or process the LCD module.

(10) NC terminal should be open. Do not connect anything.

(11) If the logic circuit power is off, do not apply the input signals.

(12) Electro-Static Discharge Control，Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the LCD modules.

- Tools required for assembling, such as soldering irons, must be properly grounded. Make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.

- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential

- 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

(13)Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

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

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

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

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

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

- Do not drop, bend or twist LCM.

2. Storage precautions

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

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：   0C ~ 40C   Relatively humidity: ≤80%

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

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

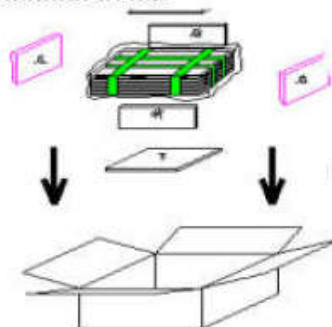## 12. PACKAGE DRAWING

第一步

将产品放入吸塑盘中，
LCD AA 面朝上，注意
防呆方向

First step

Putting products into the
tray,
LCD A.A faces Upward,
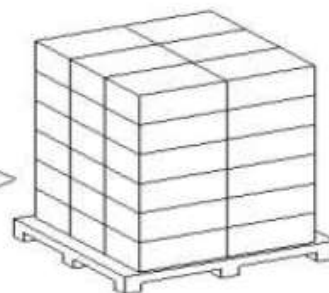(pay attention to the

第二步

每一层吸塑盘与相邻
层 ， 叠放时相错 180
度，最上层不放产品，
总 叠 加 层 数 参 考

Second step

Neighbouring trays should be
staggered 180° while stacking
up.
on the top,there is an empty
tray without product

第三步

检查无误后用胶带固
定吸塑盘，将摆好的吸
塑盘放入无尘带中并
封口；

Third step

Taping up the tray
after inspection,and
put them into a PE

第四步

外箱内侧底部和四周
放上泡棉将包好的产
品装入纸箱，合盖；

Fourth step

Putting EPE foams and
products with trays into
the carton;
Close the carton box

第五步

最后胶带封箱，贴外箱
标签

fifth step

Sealing the carton with
cellulose tape ;
Stick on a carton label,

第六步

将每箱整齐放在栈板
上并包裹最高可堆叠 6
层)

sixth step

Placing the boxes together
on a pallet (6 layers at
most),