



深圳市希恩凯电子有限公司

SHENZHEN CNK ELECTRONIC CO.,LTD.

Product Specification For LCD Module

Model NO. : CNKT0350-16001A1

CUSTOMER ITEM NO. :

REVISION : 01

APPROVAL FOR SPECIFICATIONS ONLY

APPROVAL FOR SPECIFICATIONS AND SAMPLE

CUSTOMER :

APPROVED BY :

CNK LCM R&D CENTER

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1. General Description

CNKT0350-16001A1 is a 320*480 dots matrix TFT LCD module. It has a TFT panel composed of 960sources and 480gates. The LCM can be easily accessed by micro-controller.

2. Features

Display Mode	Transmissive
	a-TFT
Display Format	Graphic 320RGB*480Dot-matrix
Input Data	16 bits parallel interface by 8080 MPU
Viewing Direction	12 o'clock
Drive	ST7796s

3. Mechanical Specification

Item	Specifications	Unit
Dimensional outline	54.94(H) x 85.50(V) x3.2 (T) (FPC not include)	mm
Resolution	320RGB*480	dots
TP Active area	50.04(H) x 77.54(V)	mm
LCD Active area	48.96(H) x 73.44(V)	mm
Pixel size	0.153(H) x 0.153(V)	mm

5. Maximum Ratings

Item	Symbol	Min	Max	Unit	Remark
Supply voltage	IOVCC	1.65	3.3	V	
Analog Supply Voltage	VCI	2.6	3.3	V	
Operating Temperature	T _{ORT}	-20	70	°C	
Storage temperature	T _{STG}	-30	80	°C	

6. Electrical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	VCI	V _{CC}		2.6	2.8	3.3	V
Input Voltage	H level	T _{IH}		0.8*IOVCC		IOVCC	V
	L level	T _{IL}		-0.3		0.2* IOVCC	
Storage temperature		I _{DD}	With internal voltage generation V _{CC} =2.8V; T _{emp} =25°C			TBD	mA

7. Backlight Characteristic

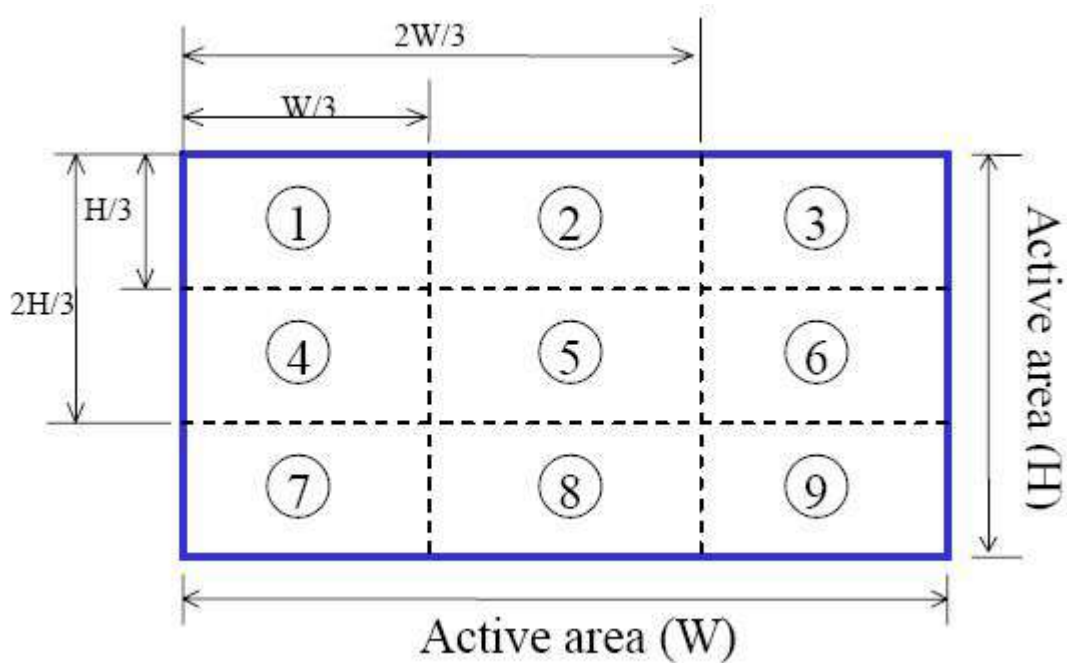
Item	Symbol	Min	Typical	Max	Unit
LED module Forward voltage	V _{LED}		3.2		V
LED module current	V _{LED}		90		mA
L/G Surface Luminance ★1	L _S		3800		Cd/m ³
LCM Surface brightness uniform ★2	L _D	80			%

★ 1Test condition is:

- (a) Center point on active area.
- (b)Best Contrast.

★2Uniform measure condition:

- (1)Measure 9 point. Measure location show below;
- (2)Uniform=(Min. brightness /Max. brightness)*100%
- (3)Best Contrast.



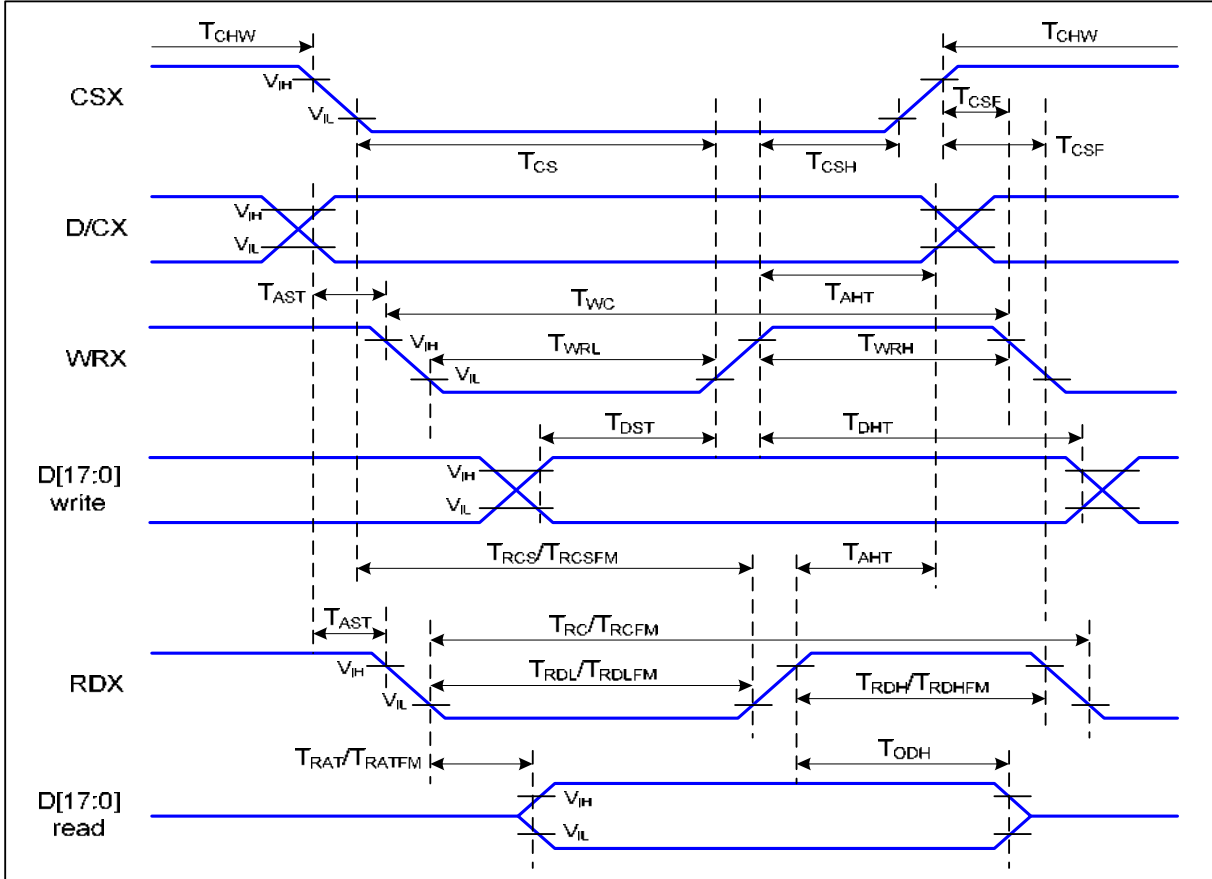
8. Module Function Description

8.1 Pin Descriptions

Pin No.	Symbol	Functional	Notes
1	TE(FMARK)	Tearing Effect output signal	
2	VCI	Power supply 2.8V	
3	IOVCC	Power supply 1.8V OR 2.8V	
4	CSX	Chip select signal input pin	
5	RSX	register select signal.	
6	WRX	write strobe signal	
7	RDX	read data at the rising edge.	
8	/RESET	Reset signal input terminal. Active at 'L'.	
9~24	DB0~DB15	Data bus	
25	GND	Power Ground	
26	YD	Touch panel pin	
27	XL	Touch panel pin	
28	YU	Touch panel pin	
29	XR	Touch panel pin	
30	LEDK1	Power supply for backlight cathode input terminal.	
31	LEDK2	Power supply for backlight cathode input terminal.	
32	LEDK3	Power supply for backlight cathode input terminal.	
33	LEDK4	Power supply for backlight cathode input terminal.	
34	LEDK5	Power supply for backlight cathode input terminal.	
35	LEDK6	Power supply for backlight cathode input terminal.	
36	LEDA	Power supply for backlight anode input terminal.	
37	GND	Power Ground	

8.2 Timing characteristics.

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



Parallel Interface Timing Characteristics (8080-Series MCU Interface)

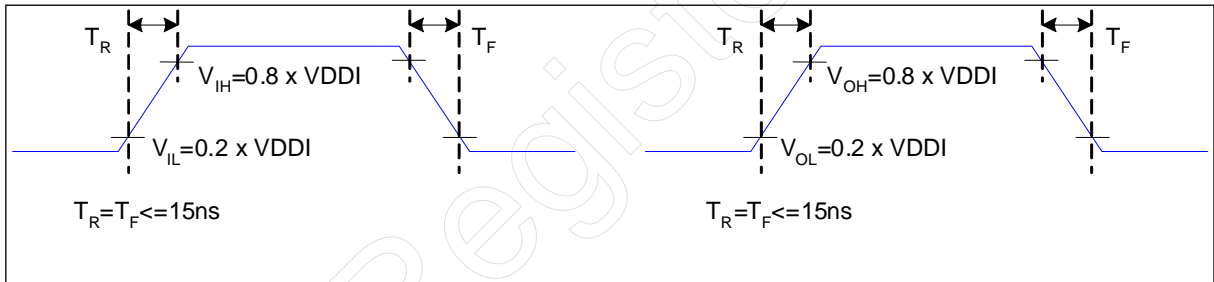
$V_{DD1}=1.8V, V_{DDA}=2.8V, AGND=DGND=0V, T_a=25\text{ }^{\circ}\text{C}$

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
	T_{DHT}	Data hold time	10		ns	
	T_{RAT}	Read access time (ID)	-	40	ns	
	T_{RATFM}	Read access time (FM)	-	340	ns	
	T_{ODH}	Output disable time	20	80	ns	

8080 Parallel Interface Characteristics



Rising and Falling Timing for I/O Signal

Note: The rising time and falling time (T_r , T_f) of input signal and fall time are specified at 15 ns or less. Logic high and low levels are specified as 20% and 80% of V_{DDI} for Input signals.



9. Electro-optical Characteristics

9.1 Optical specification

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Transmittance (without Polarizer)	T (%)	—	—	(14.74)	—	—	
Contrast Ratio	CR	$\theta=0$	400	500	—	—	(1)(2)
Response time	Rising	T_R	—	(4)	(8)	msec	(1)(3)
	Falling	T_F	—	(12)	(24)		
Color gamut	S(%)			(60)		%	
Color chromaticity (CIE1931)	White	W_x	(0.283)	(0.303)	(0.323)	(1)(4) CF glass	
		W_y	(0.305)	(0.325)	(0.345)		
	Red	R_x	(0.606)	(0.626)	(0.646)		
		R_y	(0.314)	(0.334)	(0.354)		
	Green	G_x	(0.257)	(0.277)	(0.297)		
		G_y	(0.529)	(0.549)	(0.569)		
Blue	B_x	(0.122)	(0.142)	(0.162)			
	B_y	(0.102)	(0.122)	(0.142)			
Viewing angle	Hor.	θ_L	60	70	—	Viewing Angle base on using EWV Polarizer Reference Only	
		θ_R	60	70	—		
	Ver.	θ_U	60	70	—		
		θ_D	40	60	—		
Optima View Direction			12 O'clock			(5)	

9.2 Measuring Condition

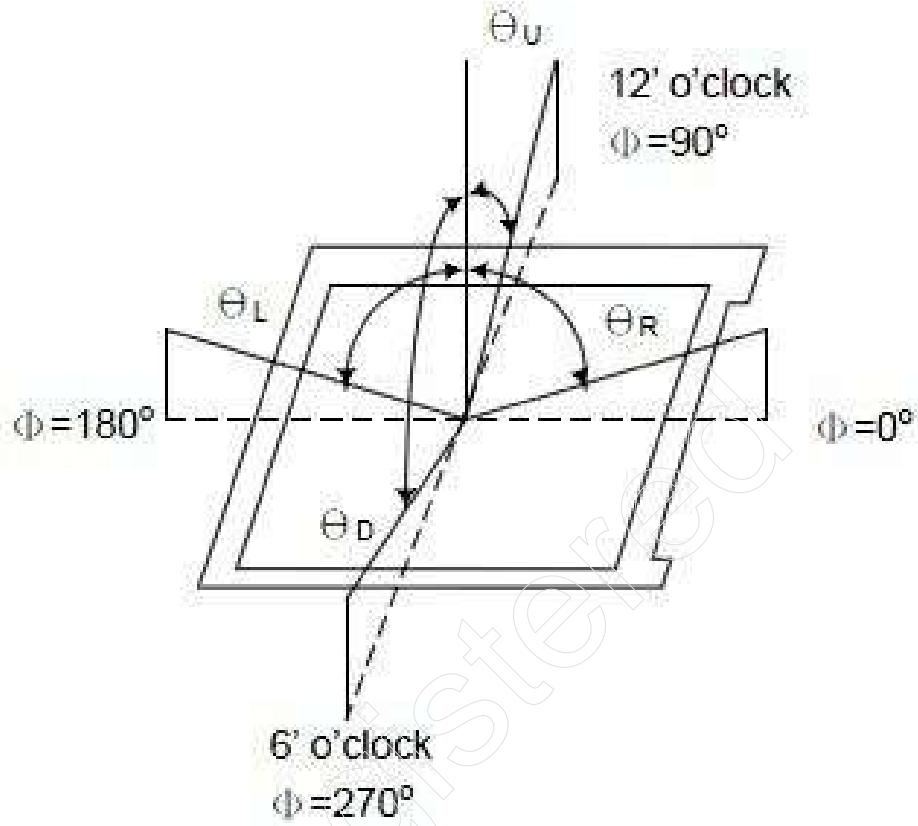
- _ Measuring surrounding : dark room
- _ Ambient temperature : $25 \pm 2^\circ\text{C}$
- _ 15min. warm-up time.

9.3 Measuring Equipment

- _ FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.



Note (1) Definition of Viewing Angle :

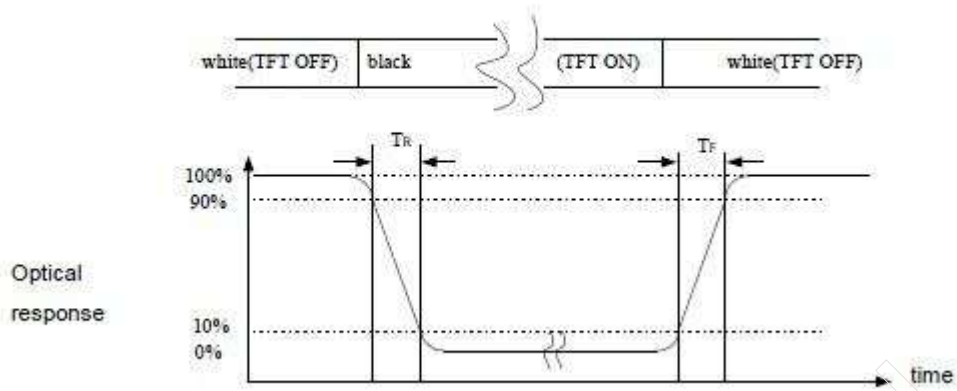


Note (2) Definition of Contrast Ratio(CR) :
measured at the center point of panel

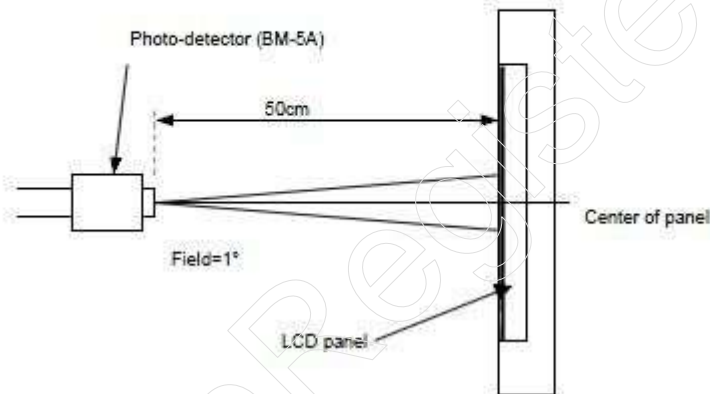
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$



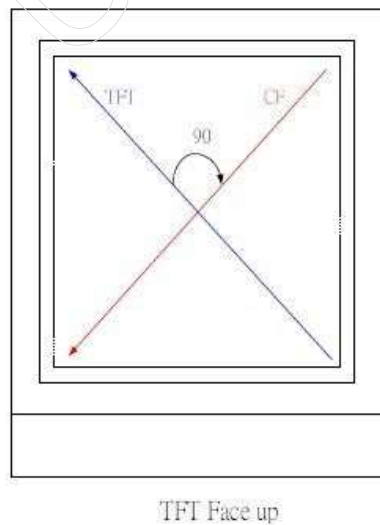
Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



Note (5) Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.)



10. Reliability

10.1Mtbf

The LCD module shall be designed to meet a minimum MTBF value of 50000 hours with normal

10.2Test condition

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Non-Operating Test	80°C*240Hrs	◦ No Defect Of Operational Function In Room Temperature Are Allowable ◦ IDD of LCM in Pre-and Post-Test Should Follow Specification
2	Low Temperature Non-Operating Test	-30°C*240Hrs	
3	High Temperature/Humidity Non Operating Test	60°C*90%RH*240Hrs	
4	High Temperature Operating Test	70°C*240Hrs	
5	Low Temperature Operating Test	-20°C*240Hrs	
6	Thermal Shock Test	-20°C (30Min) ↔70°C (30Min) *10CYCLES	

Notes:

1. Judgments should be made after exposure in room temperature for two hours.
2. The distill water is used for the high temperature/humidity test.
3. The sample above is individually for every reliability tests condition.

11.Inspection standards

1.AQL(Acceptable Quality Level)

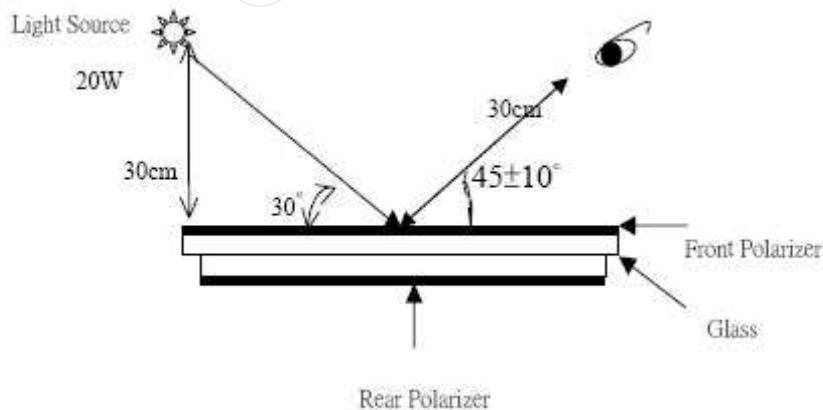
AQL of major and minor defect.

	MAJOR DEFECT	MINOR DEFECT
AQL	0.65	1.5

2. Basic conditions for inspection

The LCM face to us, in normal environment, the lux is 1000 ± 200 . (Darkroom's lux: 100 ± 50), About an angle of incidence 30, a distance of 30 cm with an angle of 45 degree to check the products without uncovering the film!

(As shown below)


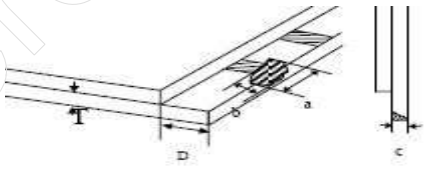
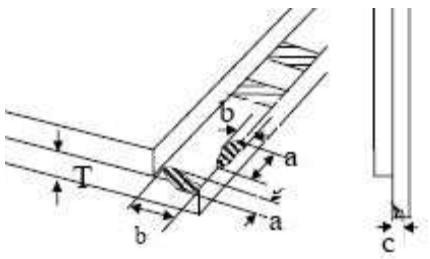
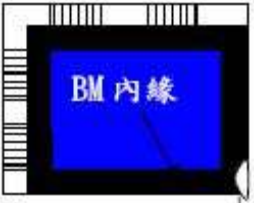


3.Inspection item and criteria

3.1 Visual inspection criterion in immobility

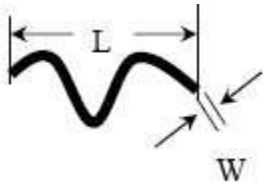
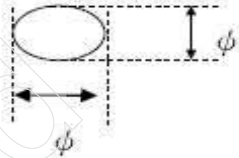


3.1.1 Glass defect


NO	Defect item	Criteria	Remark
1	Dimension Unconformity (Major defect)	By Engineering Drawing	
2	Cracks (Major defect)	1. Linear cracks panel 【Reject】 2. Nonlinear crack contrast by limited sample	
3	Glass extrude the conductive area (minor defect)	a: disregards and no influence assemblage. 1) $b \leq 1/3$ Pin width (non bonding area) 【Accept】 2) bonding area ≤ 0.5 mm 【Accept】	A: Length, b: Width
4	Pin-side ,conductive area damaged (minor defect)	(a c: disregards) $b \leq 1/3$ of effective length for bonding electrode 【Accept】	a: length, b: Width, c: Thickness 
5	Pin-side, non-conductive area damaged (minor defect)	1) Damage area don't touch the ITO (Including contraposition mark, except scribing mark) 【Accept】 2) $C < T$ $b \cong BM 1/3$ of width 【Accept】 3) $c = T$ b not touch the seal glue 【Accept】 4) a disregards	a: Length, b: Width c: Thickness 
6	Non-pin-side damage (minor defect)	$c < T$ 1) b exceeds $1/3 B_m$ 【Reject】 $c = T$ b not touch the seal glue 【Reject】	c: Thickness b: width of  damage

3.1.2 LCD appearance defect (View area)

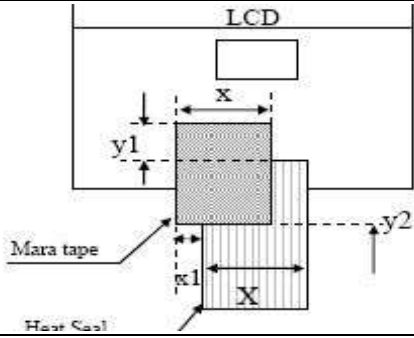
NO	Defect item	Criteria		Remark
1	Fiber、 glass cratch、 polarizer	Specification	Allowable	note 1: L: Length, W: Width
		$W \leq 0.03$ mm	disregard	note 2: disregard if out of AA

	scratch/folded (minor defect)	0.03mm<W ≤ 0.05mm; L ≤ 3.0mm	2	
		0.05mm<W ≤ 0.1mm; L ≤ 3.0mm	1	
		W>0.1mm;L>3.0mm	0	
2	Polarizer bubble, concave and convex (minor defect)	$\phi \leq 0.2\text{mm}$	disregard	note1: $\phi = (L+W)/2$, L:Length, W :Width note2:disregard if out of AA
		$0.2\text{mm} < \phi \leq 0.3\text{mm}$	2	
		$0.3\text{mm} < \phi \leq 0.5\text{mm}$	1	
		$0.5\text{mm} < \phi$	0	
3	Black dots, dirty dots, impurities, eye winker (minor defect)	$\phi \leq 0.15\text{mm}$	disregard	note2:disregard if out of AA 
		$0.15\text{mm} < \phi \leq 0.25\text{mm}$	2	
		$0.25\text{mm} < \phi \leq 0.3\text{mm}$	1	
		$0.3\text{mm} < \phi$	0	
4	Polarizer prick (minor defect)	$\phi \leq 0.1\text{mm}$	disregard	note1: $\phi = (L+W)/2$, L=Length, W=Width note2:the distance between two dots>5mm
		$0.1\text{mm} < \phi \leq 0.25\text{mm}$	3	
		$\phi > 0.25\text{mm}$	0	

3.1.3FPC

NO	Defect item	Criteria		Remark
1	Copper screen peel (minor defect)	Copper screen peel 【Reject】		
2	No release tape or peel	No release tape or peel 【Reject】		
3	Dirty dot and impurity of FPC for customer using side (minor defect)	Specification	Allowable	Note1: Cannot have stride ITO impurities
		$\phi \leq 0.25\text{mm}$	2	
		$\phi > 0.25$	0	

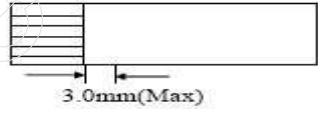
3.1.4Black tape &Mara tape

NO	Defect item	Criteria	Remark
1	FPC or H/S black tape (minor defect)	1. shift spec: 1) glue to the polarize 【Reject】 2) IC bare 【Reject】 2. left-and-right spec: 1)exceed of FPC edge or H-S edge 【Reject】 2) IC bare 【Reject】	
2	No black tape	No black tape	



	(major defect)	【Reject】	
3	Tape position mistake (minor defect)	Not by engineering drawing	
4	Mara tape defect (minor defect)	Peel before pulling the protecting film 【Reject】	

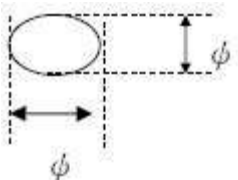
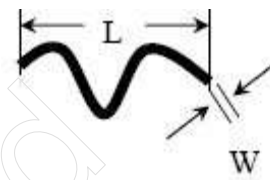
3.1.5 Silicon and Taffy glue

NO	Defect item	Criteria	Remark
1	Quantity of silicon (major defect)	Uncover the ITO and circuit area 【Reject】	note: compared by engineering
2	Taffy glue (major defect)	1.Uncover the reveal copper area【Reject】 2.Cover layer 0.3mm(Min)~3.0mm(Max) 【Reject】	note: if customer has special requirement, refer to the technical document 
3	Depth of glue covering (major defect)	Depth of glue covering overtop front Polarizer 【Reject】	Except of the special requirement

3.2Electrical criteria

NO	Defect item	Criteria	Remark
1	No display (major defect)	No display 【Reject】	
2	Missing line (major defect)	Missing line 【Reject】	
3	Seg-com light and dark (major defect)	Seg-com light and dark 【Reject】	ND filter 2% test
4	No display in immobility (major defect)	No display in immobility 【Reject】	
5	Flicker of Pattern (major defect)	Flicker of Pattern 【Reject】	
6	Mura (major defect)	ND filter 2%test	
7	Over current (major defect)	Over current 【Reject】	
8	Voltage out of specification (major defect)	Voltage out of specification 【Reject】	
9	Pattern blur, error code (major defect)	Pattern blur, error code 【Reject】	
10	Dark light, Flicker	Dark light, Flicker	



	(major defect)	【Reject】		
11	Black/white dots、Dirty dots、eye winker (major defect)	Specification	Allowable	Note1:disregard if out of AA 
		$\phi \leq 0.15\text{mm}$	disregard	
		$0.15\text{mm} < \phi \leq 0.25\text{mm}$	2	
		$0.25\text{mm} < \phi \leq 0.3\text{mm}$	1	
		$0.3\text{mm} < \phi$	0	
12	Fiber、glass crutch、Polarizer scratch/folded (major defect)	$W \leq 0.03\text{mm}$	disregard	Note1:L: Length, W: Width Note2: disregard if out of AA 
		$0.03\text{mm} < W \leq 0.05\text{mm}$ $L \leq 3.0\text{mm}$	2	
		$0.05\text{mm} < W \leq 0.1\text{mm}$ $L \leq 3.0\text{mm}$	1	
		$W > 0.1\text{mm}; L > 3.0\text{mm}$	0	

12. Precautions for using LCD modules.

12.1 Safety

- (1) Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.
- (2) If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
- (3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

12.2 Storage Conditions

- (4) Store the panel or module in a dark place where the temperature is $23 \pm 5^\circ\text{C}$ and the humidity is below $45 \pm 20\% \text{RH}$.
- (5) Store in anti-static electricity container.
- (6) Store in clean environment, free from dust, active gas, and solvent.
- (7) Do not place the module near organics solvents or corrosive gases.
- (8) Do not crush, shake, or jolt the module.

12.3 Handling Precautions

- (9) Avoid static electricity, which can damage the CMOS LSI.
- (10) The polarizing plate of the display is very fragile, please handle it very carefully.
- (11) Do not give external shock.
- (12) Do not apply excessive force on the surface.
- (13) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- (14) Do not use ketonic solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (15) Do not operate it above the absolute maximum rating.

(16) Do not remove the panel or frame from the module.

12.4 Warranty

The period is within twelve months since the date of shipping out under normal using and storage conditions.

13. Revision history

Version	Revise record	Date
01	Original version	2016-10-15