Shenzhen Leadtek Electronics Co.,Ltd

PRODUCT SPECIFICATION

TFT-LCD   MODULE

Module No：LTK040MNBCT18-V0

☑ Preliminary Specification

☐ Approval Specification

Designed by	Checked by	Approved by
jona	*tom*	*lan*

Final Approval by Customer

Approved by	Comment

※The specification of "TBD" should refer to the measured value of sample . If there is difference between the design specification and measured value, we naturally shall negotiate and agree to solution with customer.

Document Revision History

Version	Contents	Date	Note
V0	Original	2023.03.06	

1.General Specifications

NO	Item	Specification	Unit	Remark
1	LCD Size	4.0	inch	-
2	Panel Type	IPS	-	-
4	Resolution	720 x RGB x 720	pixel	-
5	Display Mode	Normally Black	-	-
6	Number of Colors	16.7M	-	-
7	Viewing Direction	ALL	-	-
8	Contrast Ratio	1200	-	TYP
9	Luminance	400	nit	TYP
10	LCM+TP Module Size	138.0(H) ×138.0(V)×3.75(T)	mm	TYP
11	Panel Active Area	101.52 (H) × 101.52(V)	mm	Note
12	Pixel Pitch	0. 047(H) ×RGB×0.141(V	mm	Note
13	Weight	NA	g	-
14	Driver IC	NV3051F	-	-
15	Light Source	6 white LED in 3S2P	-	-
16	Interface	MIPI	-	-
17	TP Driver IC	FT7311	-	-
18	TP Structure	G+F+F	-	-
19	Operating Temperature	-20~+70	℃	-
20	Storage Temperature	-30~+80	℃	-

2. Interface Pin Connection

N0	Symbol	Function
1	GND	Power ground.
2	MIPI_D0+	MIPI_DP0+ are differential data signal line
3	MIPI_D0-	MIPI_DP0- are differential data signal line
4	GND	Power ground.
5	MIPI_D1+	MIPI_DP1+ are differential data signal line
6	MIPI_D1-	MIPI_DP1- are differential data signal line
7	GND	Power ground.
8	MIPI_CLK+	CLOCK Lane positive-end input pin
9	MIPI_CLK-	CLOCK Lane engative-end input pin
10	GND	Power ground.
11	MIPI_D2+	MIPI_DP2+ are differential data signal line
12	MIPI_D2-	MIPI_DP2- are differential data signal line
13	GND	Power ground.
14	MIPI_D3+	MIPI_DP3+ are differential data signal line
15	MIPI_D3-	MIPI_DP3- are differential data signal line
16	GND	Power ground.
17	GND	Power ground.
18	IOVCC(1.8V)	A supply voltage to the digital circuit. (1.8V)
19	IOVCC(1.8V)	A supply voltage to the digital circuit. (1.8V)
20	TP-VDD	Power supply for CTP.
21	TP-SDA	SDA pin for CTP
22	TP-SCL	SCL pin for CTP
23	TP-GND	GND pin for CTP
24	TP-RSTB	Reset pin for TP
25	TP-INT	INT pin for CTP
26	TE	Not connect
27	GND	Power ground.
28	LED-	LED cathode.

| 29	LED-	LED cathode.
30	GND	Power ground.
31	NC	Not connect
32	GND	Power ground.
33	GND	Power ground.
34	NC	Not connect
35	LED+	LED anode.
36	LED+	LED anode.
37	GND	Power ground.
38	VCC(3.3V)	A supply voltage to the digital circuit. (3.3V)
39	VCC(3.3V)	A supply voltage to the digital circuit. (3.3V)
40	RESET	Reset signal（Low: Active).

3．Mechanical Drawing

Front View

138.00±0.1(CG OD)
105.60±0.2(LCM OD)
16.20
102.12±0.2(CG VA)
17.94
101.52(LCD AA)

16.20
17.94

138.00±0.1(CG OD)
109.86±0.2(LCM OD)
102.12±0.2(CG VA)
101.52(LCD AA)

4.0″ TFT
720XRGBX720
VIEWING DIRECTION:ALL

Silk Black

surface
treatment:
AG+AF

60.76±0.5

1   40

58.75±0.5

Side View

3.75±0.25(LCM+CTP)
1.45±0.1(CTP)
2.13±0.15(LCM)
0.17(OCA)

0.30±0.03
FPC+PI

Back View

16.70
104.61±0.2(SENSOR OD)

16.70

108.86±0.2(SENSOR OD)

steel disc

40   1

LED CIRCUIT DIAGRAM:

LEDA   LEDK

If= 40 mA
Vf= 18.0 V(typ)

PIN	DESCRIPTION
1	GND
2	DOP
3	DON
4	GND
5	D1P
6	D1N
7	GND
8	CLKP
9	CLKN
10	GND
11	D2P
12	D2N
13	GND
14	D3P
15	D3N
16	GND
17	GND
18	VCC-1.8V
19	VCC-1.8V
20	CTP-VDD-3.3V
21	CTP-SDA-1.8V
22	CTP-SCL-1.8V
23	CTP-GND
24	CTP-RESET
25	CTP-INT
26	TE
27	GND
28	K
29	K
30	GND
31	NC
32	GND
33	GND
34	NC
35	A
36	A
37	GND
38	VDD-3.3V
39	VDD-3.3V
40	RSTB

TP PIN

1	CTP-VDD-3.3V
2	CTP-SDA-1.8V
3	CTP-SCL-1.8V
4	CTP-GND
5	CTP-RESET
6	CTP-INT
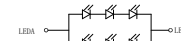
skills requirement:
1. Structure: G+F+F.
2. Transmittance: ≥83% (550nm).
3. All unmarked tolerances: ±0.10mm.
4. IC: FT7311, DITO, 5-point touch,
5. Tempering degree: 110g steel ball, the height is 40cm, the drop
will not break, and the surface hardness
    Test: ≥6H (pencil hardness test).
6. The key hole and edge safety chamfering at the unmarked part of
CG is less than or equal to 0.20mm.
7. Working temperature: −20℃~70℃, 20~85%RH, storage temperature
−30~80℃, 10~95%RH
    All materials comply with ROHS.
8. Focus on size control.

Notes:
1. Display : 4.0″, TFT
2. Resolution: 720xRGBx720
3. LCD Viewing Direction: ALL,
4. Drive IC:NV3051F
5. Display Mode: Normally Black
6. LCM Brinhgtness: 470cd/㎡(TYP)
    LCM+CTP Brinhgtness: 400cd/㎡(TYP),uniformity≥80%
7. unmark Tolerance:±0.2
8. OPERATING TEMP: −20°C~ +70°C
9. STORAGE TEMP: −30°C~ +80°C
10. Requirements on Environmental Protection: ROHS

4.Electrical Specifications

4.1 Absolute Maximum Rating

Item	Symbol	Value	Unit	Remark
I/O Power Supply	IOVCC	-0.3-4.6	V	
Analog Power Supply Voltage	VCC	-0.3-4.6	V	
Input high voltage	VIH	0.7*IOVCC	V	-
Input low voltage	VIL	0.3*IOVCC	V	-
Out put high voltage	VOH	0.8*IOVCC	V	-
Out put high voltage	VOL	0-0.2* IOVCC		

4.2 Typical Operation Conditions

4.2.2 Backlight Unit

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
BLU Current	If	-	40	-	mA	-
BLU Voltage	Vf	-	18		V	-
Power Consumption	PBL	-	720	-	mW	-

LED CIRCUIT DIAGRAM:

LEDA ○——————○ LEDK
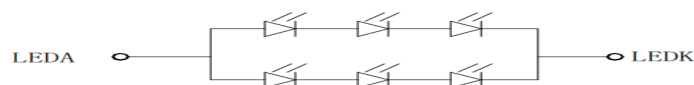
If= 40 mA
Vf= 18.0 V(typ)

4.3、DSI Power On/Off Timing

4.3.1Power On Timing of External Power IC

Case 1 – RESX line is held high or unstable by host at power on

If RESX line is held High or unstable by the host during Power On, then a Hardware Reset must be applied after both VCI and IOVCC have been applied – otherwise correct functionality is not guaranteed. There is no timing restriction upon this hardware reset.
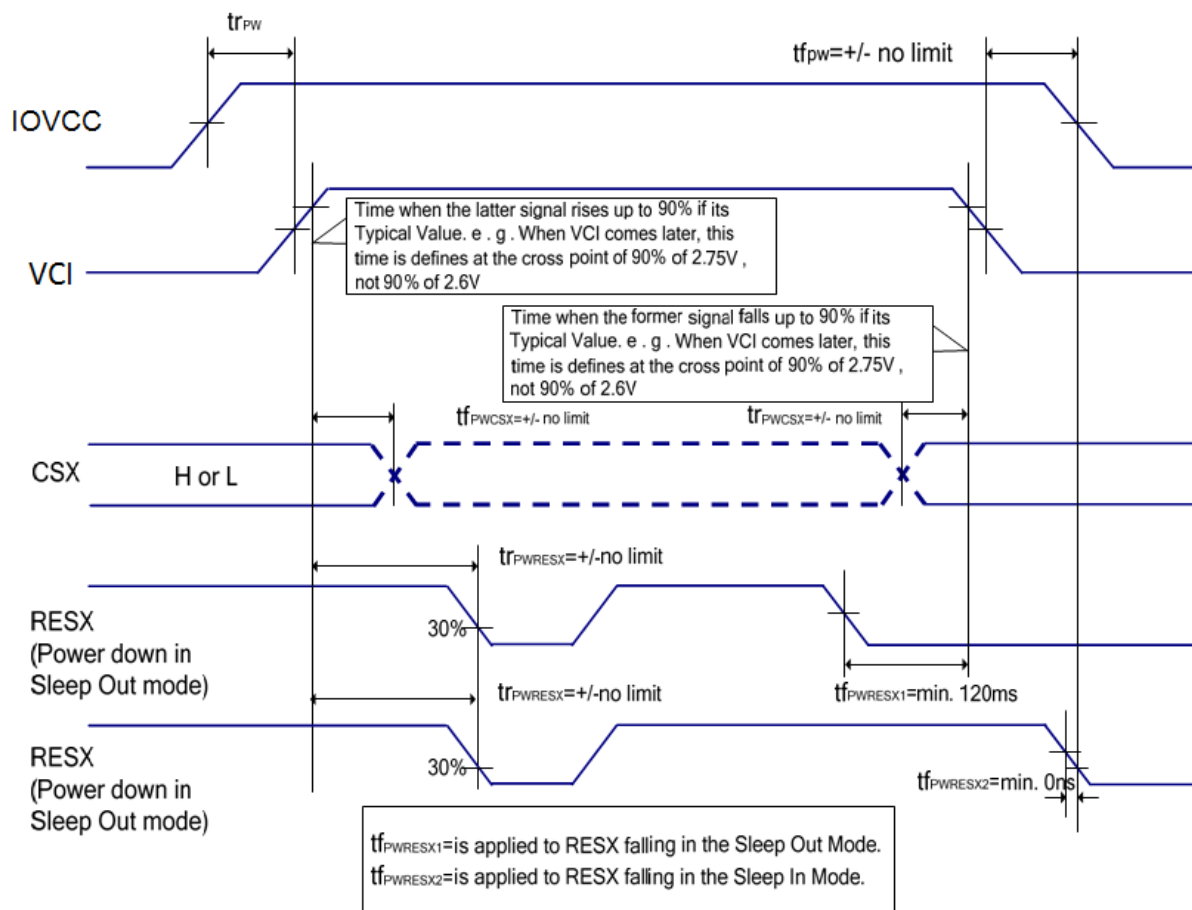
4.3.2Power Off Timing of External Power IC
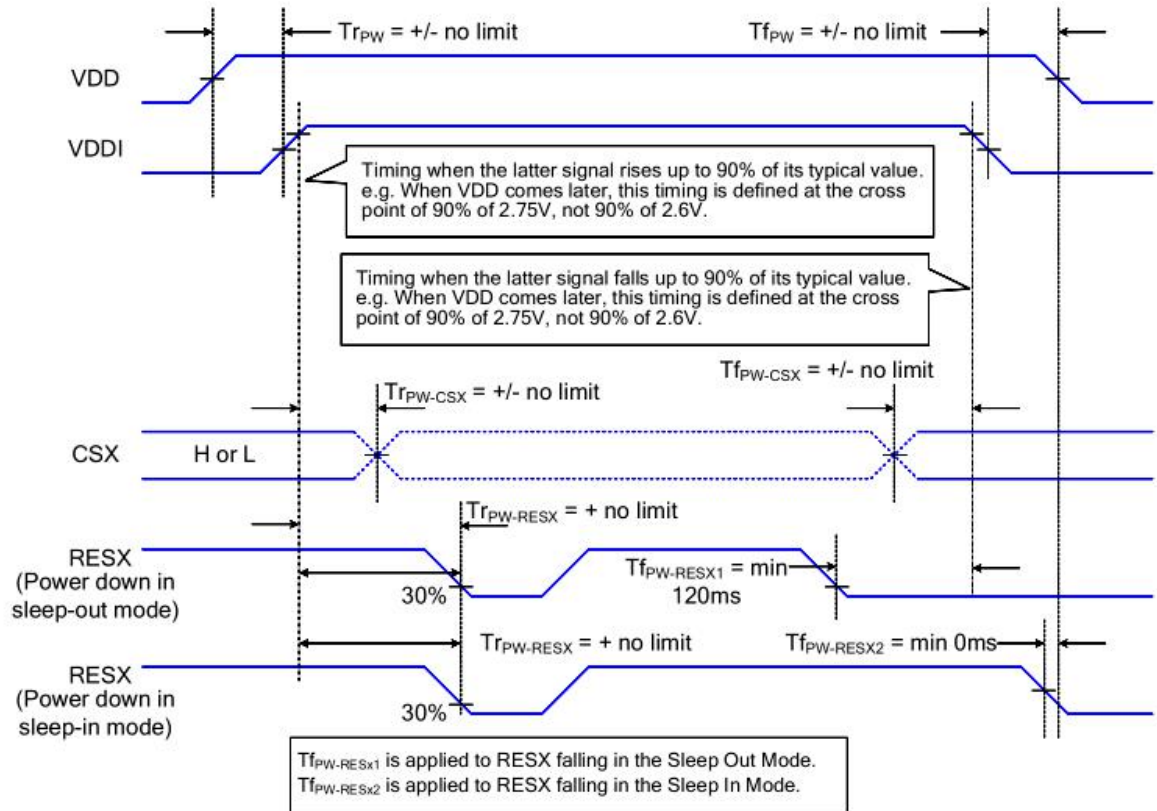
4.3.3 Below Table provide the timing parameter by external Vertical-cycle and Horizontal cycle and PCLK Frequency (Resolution for 720 horizontal x 720vertical display with Frame-Rate of 60Hz)

Parameters	Symbols	Min.	Typ	Max.	Unit
MIPI Vedio data-rate (4 lane)	-	-	500	-	Mbps
PCLK Frequency	FPCLK	TBD	63.92	-	MHz
Horizontal Synchronization	Hsync	TBD	2	-	PCLK
Horizontal Back Porch	HBP	TBD	44	-	PCLK
Horizontal Front Porch	HFP	TBD	46	-	PCLK
Hsync+ HBP+ HFP	-	TBD	90	-	PCLK
Horizontal Address (Display area)	Hadr	-	720	-	PCLK
Horizontal cycle	-	TBD	812	-	PCLK
Vertical Synchronization	Vsync	TBD	2	-	Line
Vertical Back Porch	VBP	TBD	14	-	Line
Vertical Front Porch	VFP	TBD	16	-	Line
Vsync+ VBP+ VFP	-	TBD	32	-	Line
Vertical Address (Display area)	Vadr	-	720	-	Line
Vertical cycle	-	-	812	-	Line
Frame-Rate			60		Hz

5. ELECTRO-OPTICAL CHARACTERISTICS

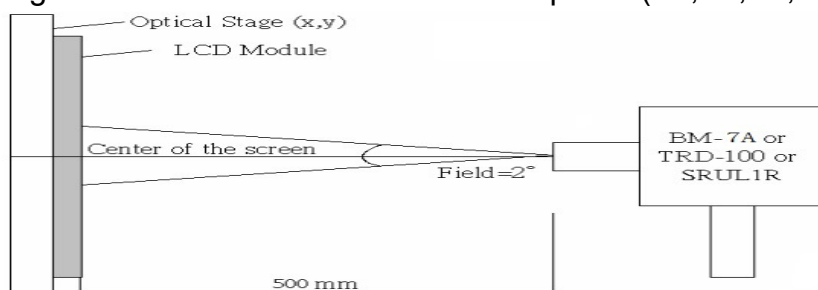The backlight should be operating for 30 minutes prior to measurement.

<Table 1. Optical Specifications >

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	80	85	-	Deg.	Note 1
		Θ_9		80	85	-	Deg.	
	Vertical	Θ_{12}		80	85	-	Deg.	
		Θ_6		80	85	-	Deg.	
Luminance Contrast ratio		CR		1000	1200	-		Note 2
Transmittance (pol)		T(%)		4.55	5.35	-	%	@Silicate BLU POL:HC+ Clear Note 3
White luminance uniformity		ΔY	$\Theta = 0°$ (Center) Normal Viewing Angle				%	
White Chromaticity		x_w		0.262	0.292	0.322		CF @C Light Note 4
		y_w		0.307	0.337	0.367		
Reproduction of color	Red	x_R		0.620	0.650	0.680		
		y_R		0.292	0.322	0.352		
	Green	x_G		0.250	0.280	0.310		
		y_G		0.533	0.563	0.593		
	Blue	x_B		0.105	0.135	0.165		
		y_B		0.111	0.141	0.171		
Response Time (Rising + Falling)		T_{RT}	Ta= 25° C $\Theta = 0°$	-	30	35	ms	Note 5

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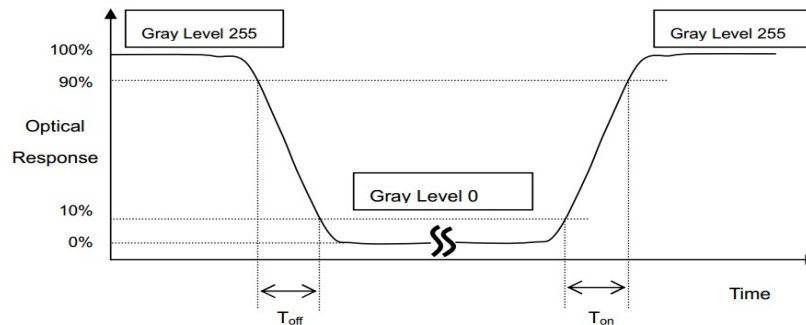 Lv = Average Surface Luminance with all white pixels (P1,P2,P3,P4,P5)
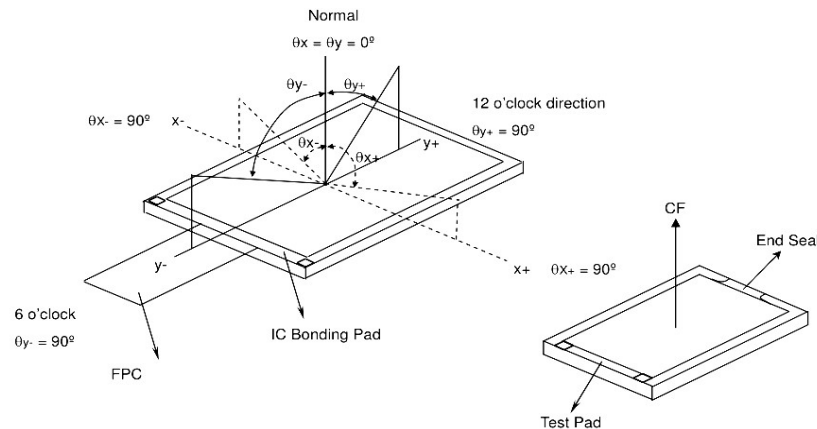

Note 3. Definition of Contrast Ratio：

CR = $\dfrac{}{\text{Average Surface Luminance with all black pixels (P1,P2,P3,P4,P5)}}$

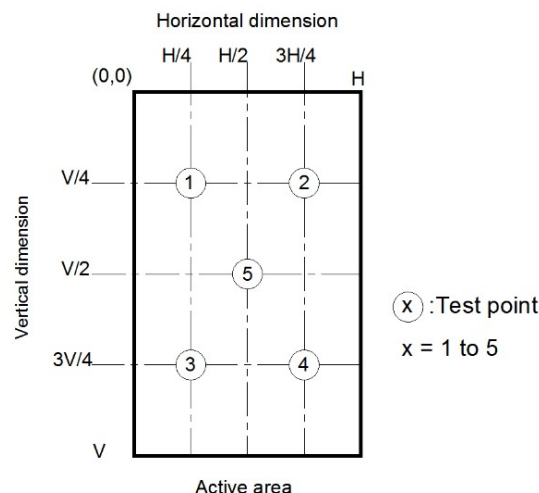Average Surface Luminance with all white pixels (P1,P2,P3,P4,P5)

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

6. **RELIABILITY TEST**

Reliability test conditions (Polarizer characteristics null)

No.	Items	Condition	Inspection after test
1	High Temperature Storage	T = 80℃ for 96 hr	Inspection after 4 hours storage at room temperature, the sample shall be free from defects: 1.Air bubble in the LCD 2.Sealleak; 3.Non-display; 4.missing segments; 5.Glass crack; 6.Current Idd is twice higher than initial value.
2	Low Temperature Storage	T = -30℃ for 96 hr	
3	High Temperature Operating	T = 70℃ for 96 hr	
4	Low Temperature Operating	T = -20℃ for 96 hr (But no condensation of dew)	
5	High Temp. and High Humidity	T = 60℃ /90% for 96 hr (But no condensation dew)	
6	Thermal Shock	-20℃~25℃~70℃×5cycles (30min.) (5min.) (30min.)	
7	Dropping test (non-operation)	Drop to the ground from 76cm height, one time, every side of carton. (Packing condition)	
8	Packing Vibration (non-operation)	Frequency：10Hz~55Hz~10Hz Amplitude：1.0mm, X，Y，Z direction for total 3hours (Packing condition)	
9	ESD	Voltage:±6KV R: 330Ω C: 150pF Air discharge, 10time	

Note:
  (1)The test samples should be applied to only one test item.
  (2)Sample size for each test item is 5~10pcs.
  (3)In case of malfunction defect caused by ESD damage, if it would be recovered to
       normal state after resetting, it would be judge as a good part.
       Using ionizer(an antistatic blower) is recommended at working area in order to
       reduce electro-static voltage.
       When removing protection film from LCM panel, peel off the tag slowly
       (recommended more than one second) while blowing with ionizer toward the
       peeling face to minimize ESD which may damage electrical circuit.
  (4) Please use automatic switch testing mode when test operating mode.

7. 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:
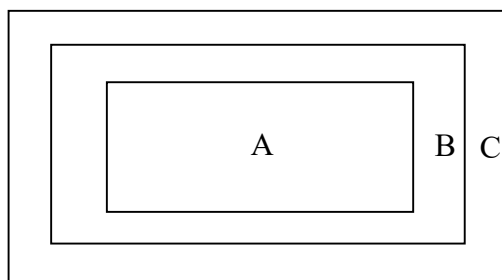
Major defect: AQL 0.65
Minor defect: AQL 1.0

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.

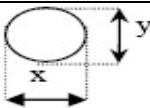Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.

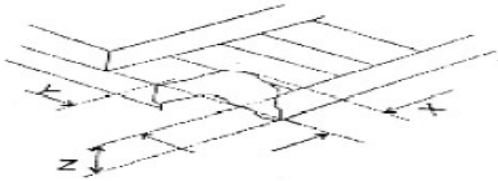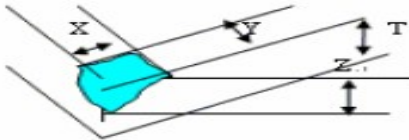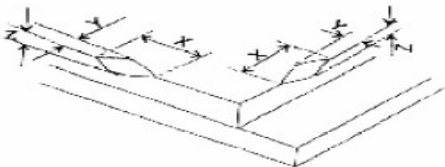## 8.Standards of inspection items

8.1 Major Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
8.1.1	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.	

8.1.2	Missing	Missing component	
8.1.3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	
8.1.4	linearity	No more than 1.5%	

9.2 Cosmetic Defect

Item No	Items to be inspected	Inspection Standard				Classification of defects
9.2.1	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	
		Φ≤0.15	Ignore			
		0.15＜Φ≤0.20	2		Ignore	
		0.20＜Φ≤0.30	1			
		Φ＞0.30	0			
	Clear Spots TP Dirt	**2**				Minor
		Zone \ Size(mm)	Acceptable Qty			
			A	B	C	
		Φ≤0.15	Ignore			
		0.15＜Φ≤0.20	2		Ignore	
		0.20＜Φ≤0.30	1			
		Φ＞0.30	0			
	Dim Spots Circle shaped and dim edged defects	**3**				Minor
		Zone \ Size(mm)	Acceptable Qty			
			A	B	C	
		Φ≤0.2	Ignore			
		0.20＜Φ≤0.40	2		Ignore	
		0.40＜Φ≤0.60	1			
		Φ＞0.60	0			

Item No	Items to be inspected	Inspection Standard						Classification of defects
9.2.2	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≤0.05		Ignore		Ignore	
		L ≤5.0	0.05＜W≤0.08		2			
			W＞0.08		0			
	Foreign material on TP film	The line can be seen after mobile phone in the operating condition:						Minor
		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			
9.2.3	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			
9.2.4	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
9.25	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. 			

10. 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 I/O 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 :   0℃ ～ 40℃   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.

11 .Packing Specification
TBD