Shenzhen Leadtek Electronics Co.,Ltd

PRODUCT SPECIFICATION

TFT-LCD   MODULE

Module No：LTK050WVBLM16-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.

1.Document Revision History

Version	Contents	Date	Note
V0	Original	2021.12.06	

2 GENERAL INFORMATION

Item	Specification	Unit
Panel size	5.0 TFT	inch
Display Mode	Normally White	--
Resolution	800(RGB)x480	Pixel
Pixel per inch	0.135 (H) x 0.135 (V)	-
Viewing direction(Gray inversion)	Free	-
Module outline dimension	120.70(H)*75.8(V)*3.15(D)	mm^3
LCD Panel Active Area	108.0(H)*64.8(V)	mm^2
Touch Panel View Area	-	mm^2
Colors	16.2M	-
Driver IC	ILI6123H-9G	-
Interface Type	RGB	--
Backlight Type	White LED	--

3 ABSOLUTE MAXIMUM RATINGS

AGND = GND = 0V, Ta = 25℃

Parameter	Symbol	Min	Max	Unit	Note
Power Supply voltage	VDD~GND	-0.3	+3.6	V	
Operating temperature	Topr	-20	+70	℃	
Storage temperature	Tstg	-30	+80	℃	
Operating Ambient Humidity	Hop	10	*2	RH	*1
Storage Humidity	Hst	10	*2	RH	*1

* 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.
 *1 Non-condensation.
 *2 Temp.≤ 60℃,90%RH Max. Temp. > 60℃,Absolute humidity shall be less than 90%RH.

4 ELECTRICAL CHARACTERISTICS

4.1 Driving TFT LCD Panel

AGND = GND = 0V, Ta = 25℃

Parameter	Symbol	Min	Typ	Max	Unit
Digital Supply Voltage	VDD	3.0	3.3	3.6	V
Gate On Voltage	VGH	-	(15)	-	V
Gate Off Voltage	VGL	-	(-10)	-	V
Common Electrode Driving Signal	VCOM(*1)	-	(0)	-	V
Input voltage 'H' level	V_{IH}	0.7*VDD	—	VDD	V
Input voltage 'L' level	V_{IL}	GND	—	0.3*VDD	V
Output voltage 'H' level	V_{OH}	VDD-0.4	—	VDD	V
Output voltage 'L' level	V_{OL}	GND	—	GND+0.4	V

*1. Typical VCOM is only a reference value, it must be optimized according to each LCM. Please adjust VCOM to make the flicker level be minimum for getting excellent image.

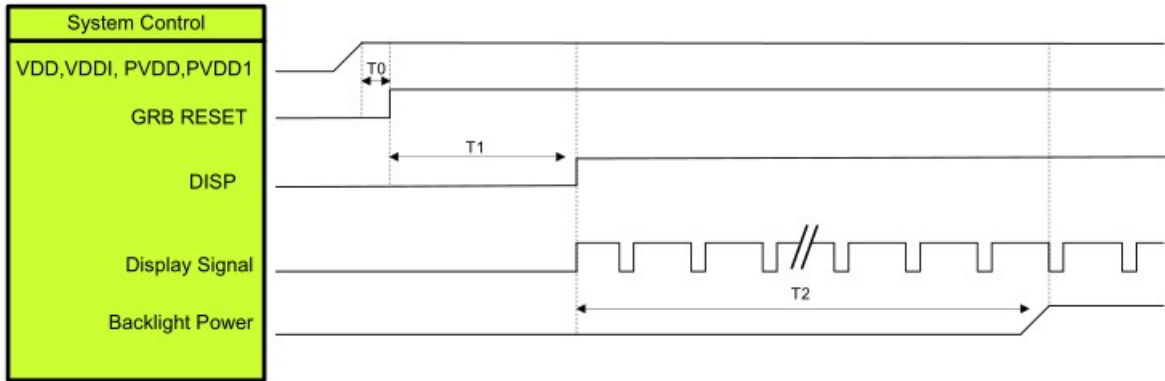## 4.2 Backlight Characteristics

Ta = 25℃

Item	Symbol	Min	Typ	Max	Unit	Condition
Forward voltage	Vf	16.8	18	19.2	V	If=60 mA
Number of LED	-	6X3			Piece	-
Connection mode	S/P	6Serial/3Parallel			-	-

Using condition: constant current driving method If= 3×20mA (+/-10%)
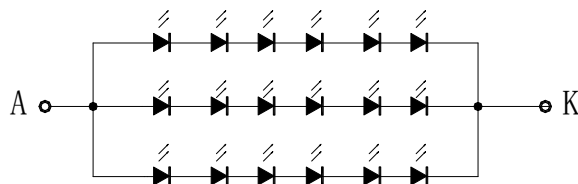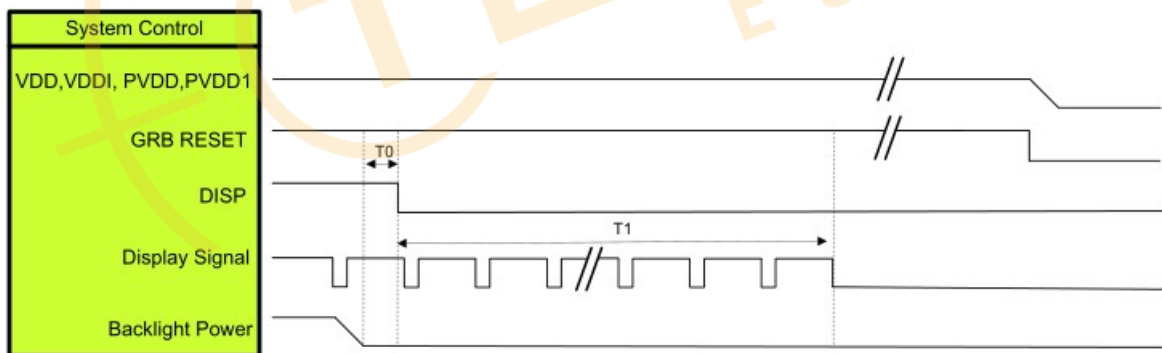
5 TIMING CHARACTERISTICS

5.1 Power On Sequence

Symbol	Description	Min.Time	Unit
T0	System power stability to GRB RESET signal	0	ms
T1	GRB RESET= "High" to DISP="High"	10	ms
T2	Display Signal output to Backlight Power on	250	ms

Note: RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]
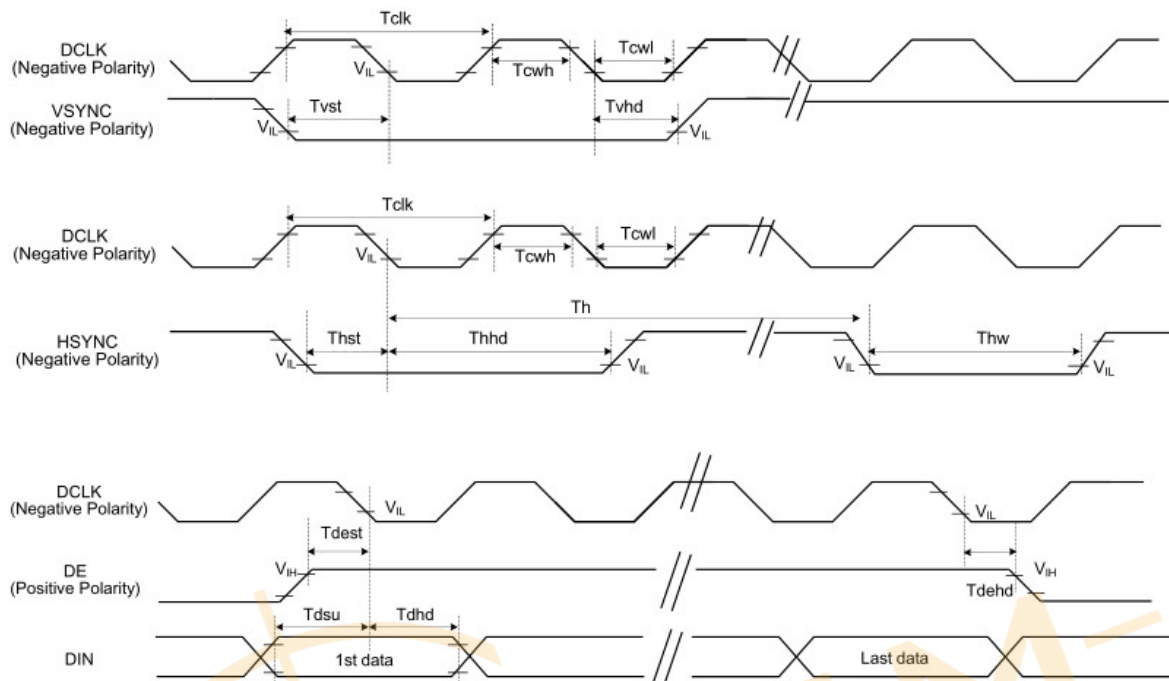
5.2 Power Off Sequence

Symbol	Description	Min.Time	Unit
T0	Backlight Power off to DISP="Low"	5	ms
T1	DISP="Low" to IC internal voltage discharge complete	100	ms

Note: RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

5.3 Timing for RGB Interface

5.3.1 System Bus Timing for RGB Interface

(TA = 25℃,VDD=3.3V, GND=AGND=0V)

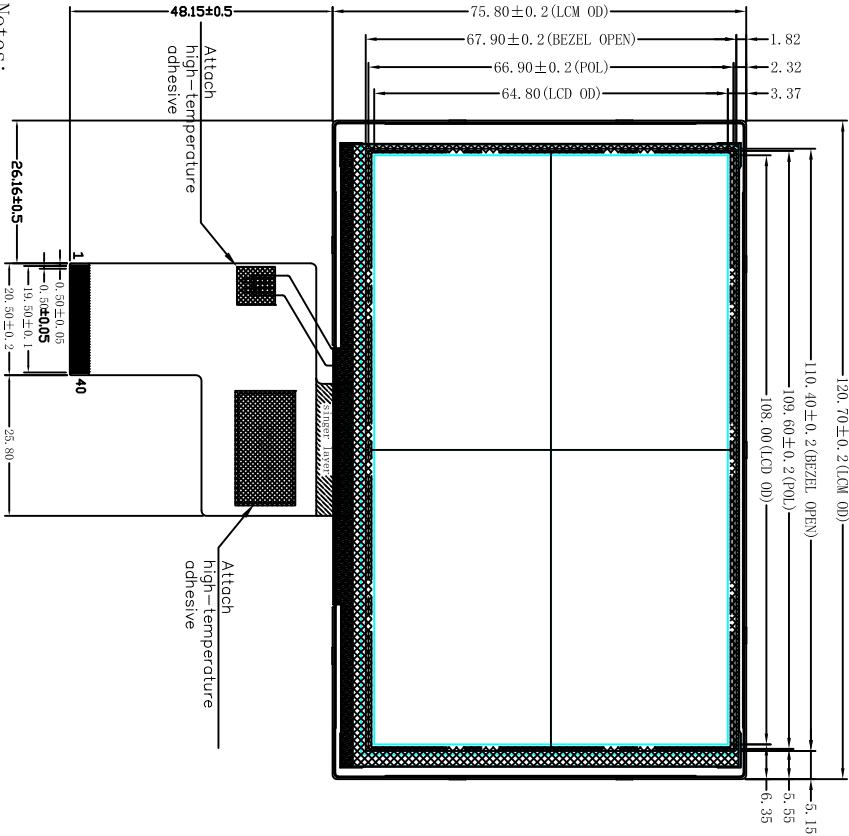| Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
DCLK Pulse Duty	Tcw	40	50	60	%	
HSYNC Width	Thw	2	-	-	DCLK	
HSYNC Period	Th	55	60	65	us	
VSYNC Setup Time	Tvst	10	-	-	ns	
VSYNC Hold Time	Tvhd	10	-	-	ns	
HSYNC Setup Time	Thst	10	-	-	ns	
HSYNC Hold Time	Thhd	10	-	-	ns	
Data Setup Time	Tdsu	10	-	-	ns	
Data Hold Time	Tdhd	10	-	-	ns	
DE Setup Time	Tdesu	10	-	-	ns	
DE Hold Time	Tdehd	10	-	-	ns	

5.3.2 Timing for RGB Interface DE Mode.
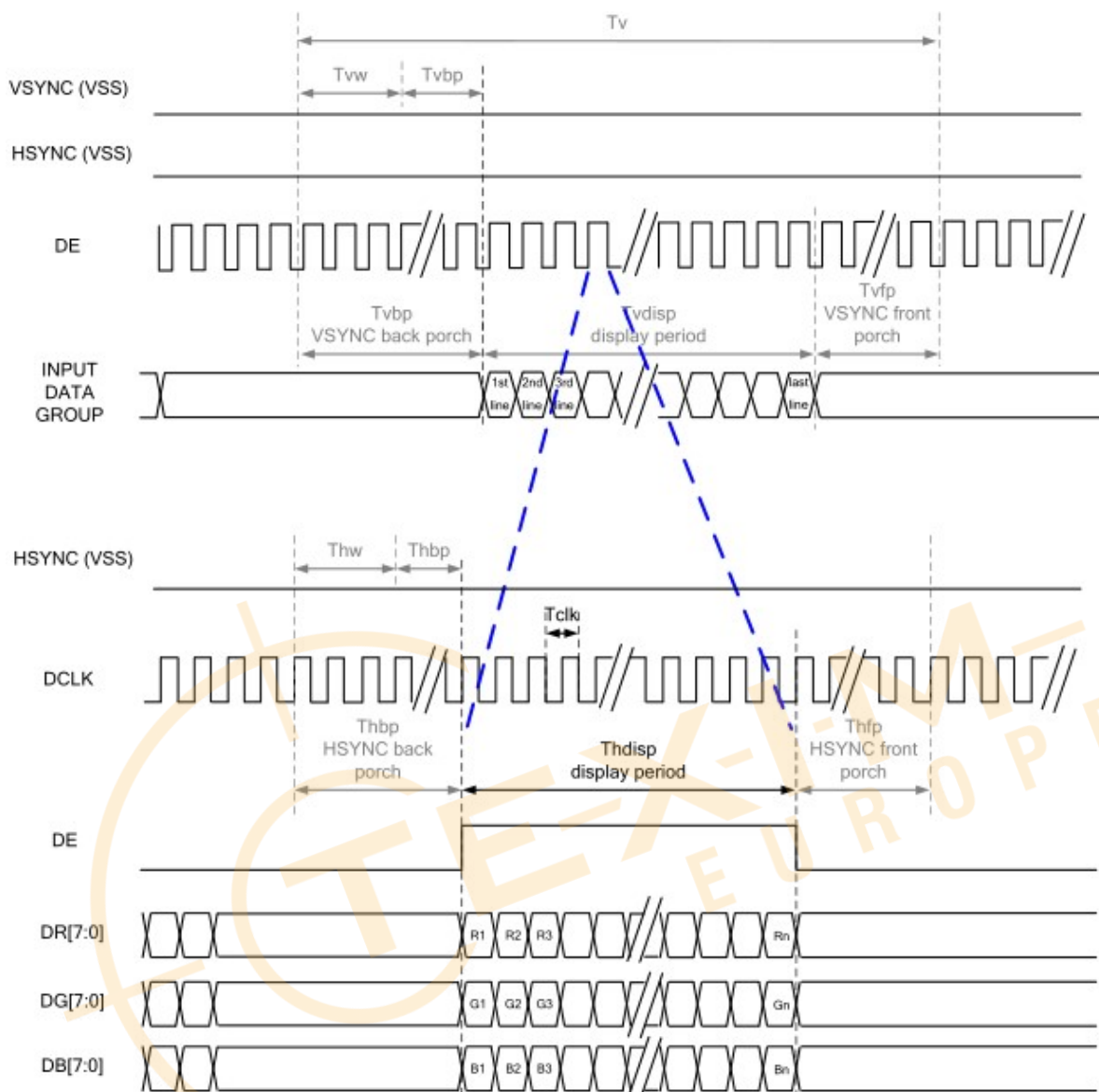
5.3.3 Parallel 24-bit RGB Input Timing Table

(TA = 25℃,VDD=3.3V, GND=AGND=0V)

Parallel 24-bit RGB Input Timing Table							
Item		Symbol	Min.	Typ.	Max.	Unit	Conditions
DCLK Frequency		Fclk	23	25	27	MHz	
HSYNC	Period Time	Th	808	816	896	DCLK	
	Display Period	Thdisp		800		DCLK	
	Back Porch	Thbp	4	8	48	DCLK	
	Front Porch	Thfp	4	8	48	DCLK	
	Pulse Width	Thw	2	4	8	DCLK	
VSYNC	Period Time	Tv	488	496	504	HSYNC	
	Display Period	Tvdisp		480		HSYNC	
	Back Porch	Tvbp	4	8	12	HSYNC	
	Front Porch	Tvfp	4	8	12	HSYNC	
	Pulse Width	Tvw	2	4	8	HSYNC	

6 Mechanical Drawing

Front View

48.15±0.5
75.80±0.2 (LCM OD)
67.90±0.2 (BEZEL OPEN)
66.90±0.2 (POL)
64.80 (LCD OD)
1.82
2.32
3.37

26.16±0.5

Attach high-temperature adhesive

Attach high-temperature adhesive

0.50±0.05
0.50±0.05
19.50±0.1
20.50±0.2
25.80

1
40

stinger layer

110.40±0.2 (BEZEL OPEN)
109.60±0.2 (POL)
108.00 (LCD OD)
120.70±0.2 (LCM OD)

5.15
5.55
6.35

Side View

Back View

coding area

stinger layer

LEADTEK DISPLAY

40
1

IF=60mA, VF=18.0 (TYP)

K
A

Notes:

1. Display : 5.0″ , TFT
2. Resolution: 800xRGBx480
3. LCD Viewing Direction: ALL,
4. Display Mode: Normally White
5. LCM Brightness: 330cd/m² (TYP), uniformity≥80%
6. unmark Tolerance:±0.2
7. OPERATING TEMP: -20° C~ +70° C
8. STORAGE TEMP: -30° C~ +80° C
9. Requirements on Environmental Protection: ROHS
10.

REV		DESCRIPTION	DATE	NAME
		NEW	2023.02.13	IAN

SCALE:1/1 | UNIT:mm | PAGE:1/1

Part No: LTK050WBLM16

Customer No: | VER:V0

LEADTEK COMPANY LIMITED

Approve | Check JONA | Drawn IAN

PIN	DESCRIPTION
1	LED-
2	LED+
3	GND
4	VDD
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	DCLK
31	DISP
32	HS
33	VS
34	DE
35	NC
36	GND
37	NC
38	NC
39	NC
40	NC

7 INTERFACE SIGNAL

Pin No.	Symbol	Description
1	VLED-	LED backlight cathode.
2	VLED+	LED backlight anode.
3	GND	Power ground
4	VDD	Power supply for the analog power.
5	R0	Red data bus(LSB)
6~11	R1~R6	Red data bus
12	R7	Red data bus(MSB)
13	G0	Green data bus(LSB)
14~19	G1~G6	Green data bus
20	G7	Green data bus(MSB)
21	B0	Blue data bus(LSB)
22~27	B1~B6	Blue data bus
28	B7	Blue data bus(MSB)
29	GND	Power ground
30	DCLK	Parallel RGB clock input.
31	DISP	External standby mode selection,low active.
32	HSYNC	Horizontal sync input.
33	VSYNC	Vertical sync input..
34	DE	Data Enable signal input
35	NC	NC
36	GND	Power ground
37	XR	NC
38	YD	NC
39	XL	NC
40	YU	NC

8.0 OPTICAL CHARACTERISTICS

8.1 Optical Specification (Reflective, w/ HSD FOG+D65 light)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
White Reflectance (with Polarizer)		Rw (%)	Θ=0 Normal viewing angle —	—	4.97	—	%	(4) Measuring with HSD polarizer，Reference Only Base on Vop=4.5V
Contrast Ratio		CR		—	8	—	—	(1)(2) Base on Vop=4.5V
NCS		S(%)		—	125	—	%	
White chromaticity (CIE1931)		Wx			0.344			
		Wy			0.382			
Response Time		ms			5	7		
Viewing Angle	Hor.	Θ$_L$	CR>2	—	55	—	—	(1)(4) Measuring with HSD polarizer，Reference Only
		Θ$_R$		—	55	—		
	Ver.	Θ$_U$		—	60	—		
		Θ$_D$		—	60	—		

8.2 Optical Specification (Transmissive, w/HSD FOG+D65 light)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
White Transmittance (with Polarizer)		Tr(%)	Θ=0 Normal viewing angle —	—	2.0	—	%	(4) Measuring with HSD polarizer，Reference Only Base on Vop=4.5V
Color Gamut		S(%)		—	30	—	%	
White chromaticity (CIE1931)		Wx			0.341			
		Wy			0.387			
Response Time		ms			6	8		
Viewing Angle	Hor.	Θ$_L$	CR>2	—	65	—	—	(1)(4) Measuring with HSD polarizer，Reference Only
		Θ$_R$		—	65	—		
	Ver.	Θ$_U$		—	65	—		
		Θ$_D$		—	65	—		

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.
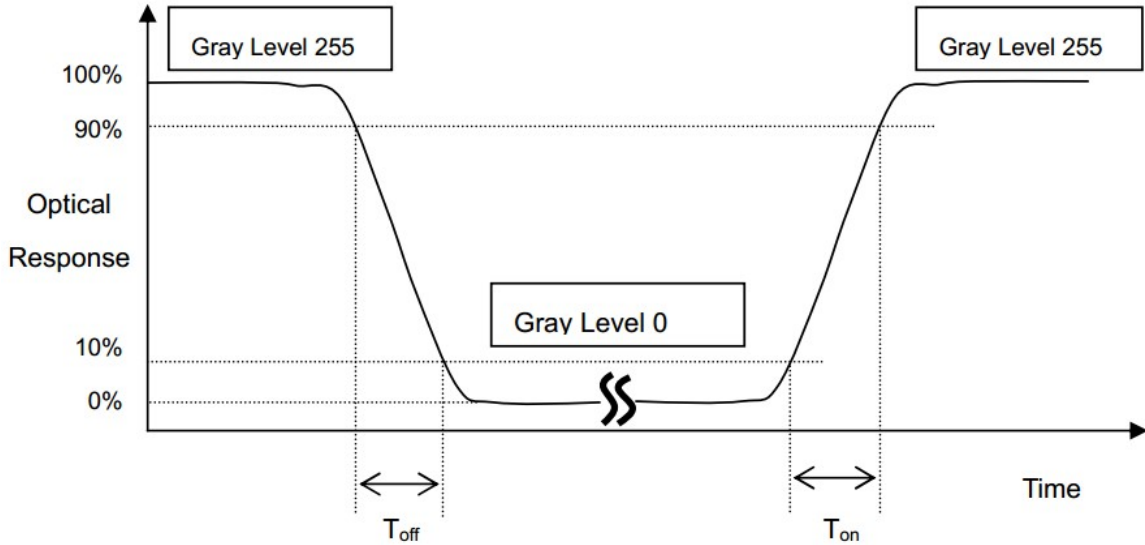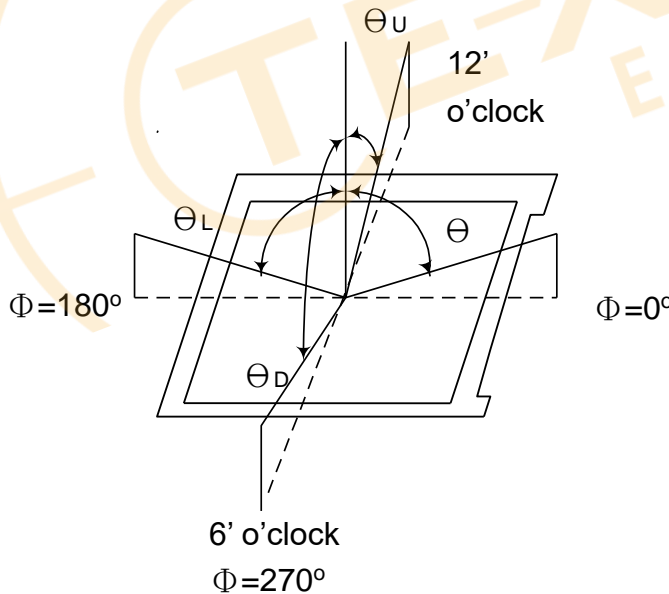

8.3   Measuring Equipment

■ DMS (DMS = Display Measurement System) of AUTRONIC-MELCHERS GmbH, motorized goniometer system for comprehensive display characterization

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

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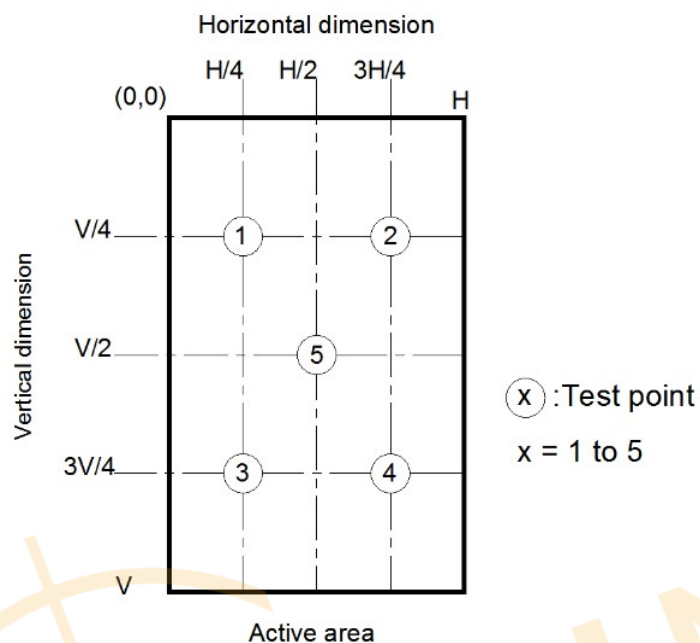
Light spot size □=7mm, 500mm distance from the LCD surface to detector lens measurement instrument is TOPCON's luminance meter BM-7A
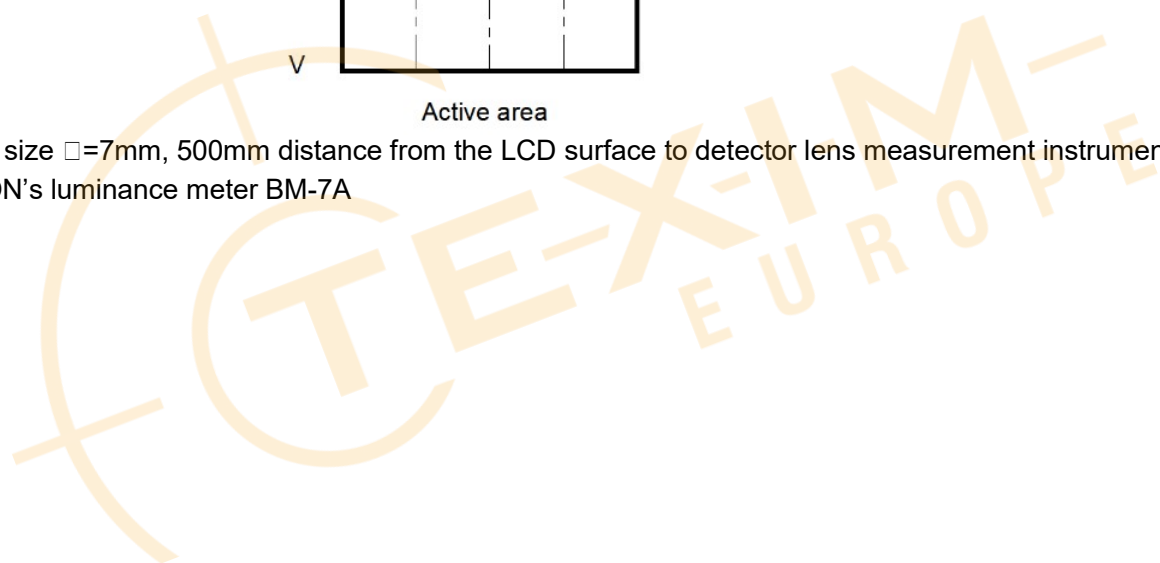
9 RELIABILITY TEST

Reliability test conditions (Polarizer characteristics null)

No.	Items	Condition	Inspection after test
1	High Temperature Storage	T = 80℃±2℃ for 48 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℃±2℃ for 48 hr	
3	High Temperature Operating	T = 70℃±2℃ for 48 hr	
4	Low Temperature Operating	T = -20℃±2℃ for 48 hr (But no condensation of dew)	
5	High Temp. and High Humidity Operating	T = 50℃±5℃ /90% for 48 hr (But no condensation dew)	
6	Thermal Shock	-20±2℃~25~70±2℃×10cycles (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.

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.
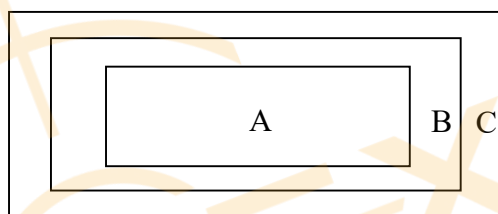
Zone A: character/Digit area
Zone B: viewing area except Zone A (Zone A + Zone B=minimum Viewing area)
Zone C: Outside viewing area (invisible area after assembly in customer's product)
Fig.1 Inspection zones in an LCD.
Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.
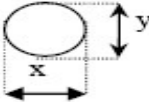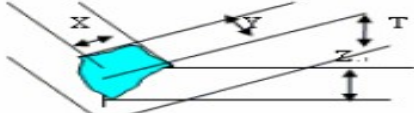
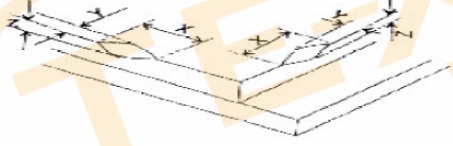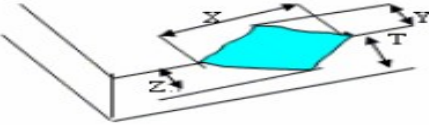## 4.Standards of inspection items

4.1 Major Defect
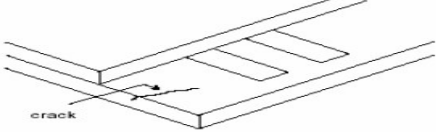
Item No	Items to be inspected	Inspection Standard	Classification of defects
4.1.1	All functional defects	1.No display	Major
		2.Display abnormally	
		3.Missing vertical，horizontal segment	
		4.Short circuit	
		5. Back-light no lighting, flickering and abnormal lighting.	
4.1.2	Missing	Missing component	

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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, sizeΦis defined as Φ=(x + y)/2 **1** Zone / Size(mm): Φ≤0.15 → Ignore (A,B); 0.15<Φ≤0.20 → 2; 0.20<Φ≤0.30 → 1; Φ>0.30 → 0; C → Ignore	Minor
	Clear Spots TP Dirt	**2** Zone / Size(mm): Φ≤0.15 → Ignore (A,B); 0.15<Φ≤0.20 → 2; 0.20<Φ≤0.30 → 1; Φ>0.30 → 0; C → Ignore	Minor
	Dim Spots Circle shaped and dim edged defects	**3** Zone / Size(mm): Φ≤0.2 → Ignore (A,B); 0.20<Φ≤0.40 → 2; 0.40<Φ≤0.60 → 1; Φ>0.60 → 0; C → Ignore	Minor

Detailed sub-tables:

1 — Clear Spots Black and white Spot defect Pinhole, Foreign Particle, polarizer Dirt

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		

2 — Clear Spots TP Dirt

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		

3 — Dim Spots Circle shaped and dim edged defects

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
4.2.2	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				
		L ≤5.0	0.05＜W≤0.08	2		Ignore		
			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				
		L ≤5.0	0.05＜W≤0.08	3		Ignore		
			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				
		5.0＜L≤10.0	0.03＜W≤0.05	2		Ignore		
		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
		Zone / Size(mm)		Acceptable Qty				
				A	B	C		
		Φ≤0.20		Ignore				
		0.20＜Φ≤0.3		2		Ignore		
		Φ＞0.30		0				

Item No	Items to be inspected	Inspection Standard			Classification of defects
4.2.5	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 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.

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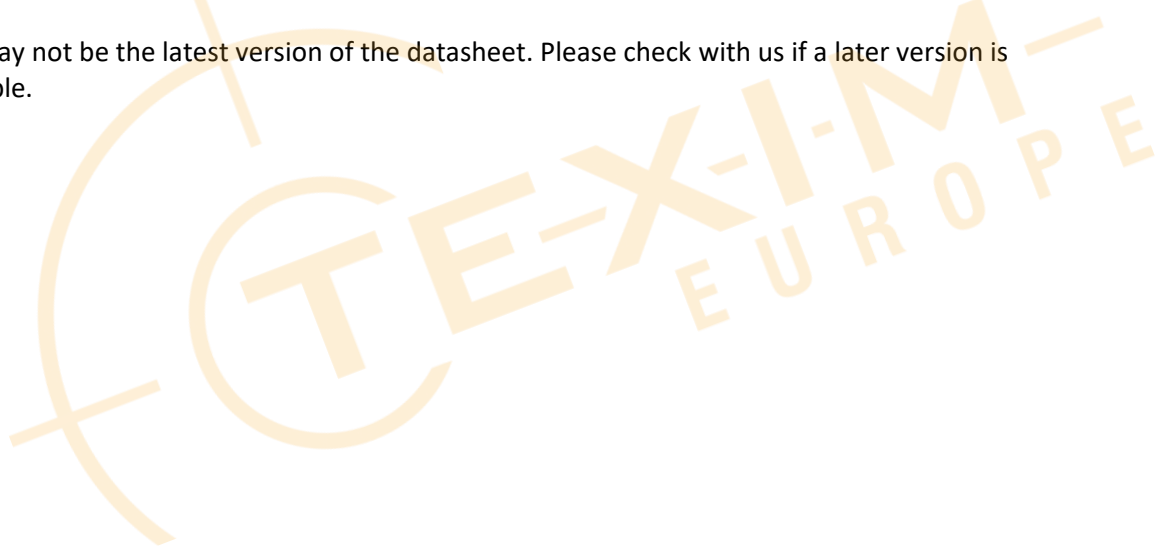
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