

Specification of LCD Module

EarthLCD-10.4-1024100

Earth Computer
Technologies, Inc.
16540-B Aston St.
Irvine , Ca. 92606

1 TABLE OF CONTENTS

2	General Description	4
3	Features	4
4	Mechanical Specification	4
5	Mechanical Dimension.....	5
6	Maximum ratings	6
7	Electrical Characteristic.....	6
7.1	TFT LCD Characteristic	6
7.2	Backlight Characteristic.....	6
8	Module Function.....	7
8.1	PIN Description	7
8.2	Timing Characteristics	8
8.2.1	Vertical Timing Diagram DE (Dual gate).....	8
8.2.2	Gate Output Timing Diagram (Dual gate)	8
8.3	Block Diagram	9
9	Electro-Optical Characteristics.....	9
9.1	Optical characteristic	9
9.2	CIE(x, y) chromaticity	10
9.3	Notes	10
10	Reliability.....	11
10.1	MTTF	11
10.2	Tests	11
10.3	Color performance	12
11	Inspection Criteria.....	12
11.1	Inspection Conditions	12
11.1.1	Environmental conditions	12
11.1.2	The external visual inspection	12
11.2	Light Method.....	12
11.3	Classification Of Defects	13
11.3.1	Major defect.....	13
11.3.2	Minor defect	13
11.4	Sampling & Acceptable Quality Level	13

11.5	Definition Of Inspection Area	14
11.6	Item and Criteria	14
11.6.1	Visual inspection criterion in cosmetic	14
11.6.2	LCM electrical criterion	16
11.6.3	Others.....	18
12	Illustration of LCD Barcode	18
13	Package Drawing.....	19
14	RoHS Compliant Warranty	20
15	Precautions for Use.....	20
15.1	Safety	20
15.2	Storage Conditions.....	20
15.3	Installing LCD Module	20
15.4	Precautions For Operation.....	20
15.5	Handling Precautions	21
15.6	Warranty.....	21
16	Revision History	21

2 GENERAL DESCRIPTION

The EarthLCD-10.4-1024100 is a Color TFT LCD supplied by EarthLCD. This main module has a 10.4 inch diagonally measured active display area with 1024 X RGB X 100 resolutions. Each pixel is divided into Red, Green and Blue sub-pixels and dots that are arranged in vertical stripes. LCD color is determined with Dithering 65K Color signal for each pixel. The EarthLCD-10.4-1024100 has been designed to apply the interface method that enables low power, high speed, and high contrast.

3 FEATURES

Display Mode	Transmissive Type
	a-Si color TFT LCD, Normally white type
Screen Size	10.4 inch
Display Format	Graphic 1024*RGB*100 Stripe type
Color	65K color
Interface	RGB IF(16 bit)
Driver IC	HX8282-A*1, HX8678-C*1
Viewing Direction	6 o'clock (Gray inversion: 12 o'clock)
Weight	103.96 grams

4 MECHANICAL SPECIFICATION

Item	Specification	Unit
Dimensional outline	288.92(W)×41.5(H)*×6.32(D)	mm
Resolution	1024×(R, G, B)×100	dot
Active Area	264.192(W)×25.8(H)	mm
Pixel pitch	0.258(W)×0.258(H)	mm
Polarizer	Anti-Glare	

*Without FPC

5 MECHANICAL DIMENSION

[illegible]

6 MAXIMUM RATINGS

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

Item	Symbol	Values		Unit	Condition
		Min	Max		
Operating Temperature	T _{op}	0	50	°C	
Storage Temperature	T _{stg}	-10	60	°C	
Humidity	H _{stg}	-	90	%RH	*

*T_A≤40°C without dewing

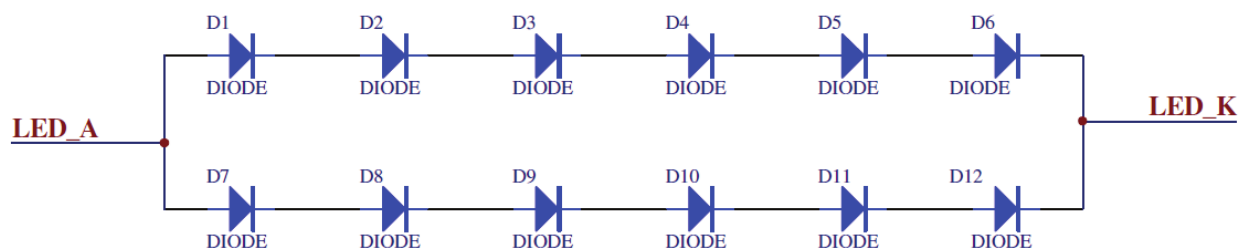
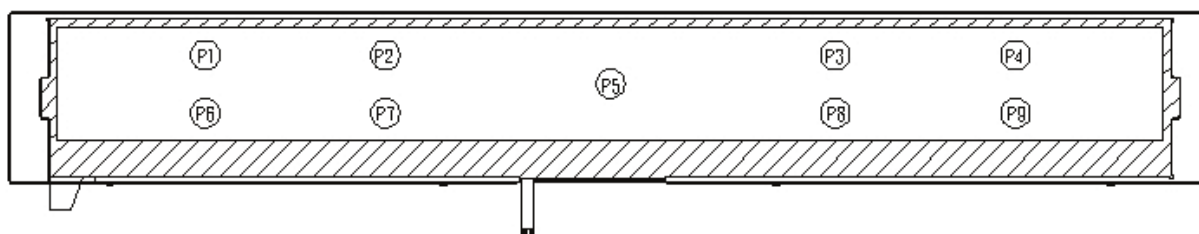
7 ELECTRICAL CHARACTERISTIC

7.1 TFT LCD CHARACTERISTIC

Item		Symbol	Min.	Typ.	Max.	Unit
Power supply for LCD	Voltage	VDD	3.0	3.3	3.6	V
	Current	I _{dd}	-	-	65	mA
Driver input signal voltage	H	V _{IH}	0.7*VDD	-	VDD	V
	L	V _{IL}	0	-	0.3*VDD	V

7.2 BACKLIGHT CHARACTERISTIC

Item		Symbol	Values			Unit
			Min.	Typ.	Max.	
Power Consumption		P _{LED}	-	792.0	878.4	mW
Power supply for LED	Voltage	I _{LED}	-	19.8	21.6	V
	Current	V _{LED}	-	40	50	mA
Luminous color		White				



- a. Test Instrument: BM-7 (Distance =500mm; Field = 1)
- b. Light Source: White LED * 12
- c. Uniformity = (Min. Brightness / Max. Brightness)*100%
- d. Uniformity ≥ 70%
- e. Estimated backlight lifetime: 20,000 hours. “LED decay lifetime” is defined as the brightness decrease to 50% original brightness that the ambient temperature is 25°C and LED dice current=20mA.
- f. LED: Everlight 99-616UMC

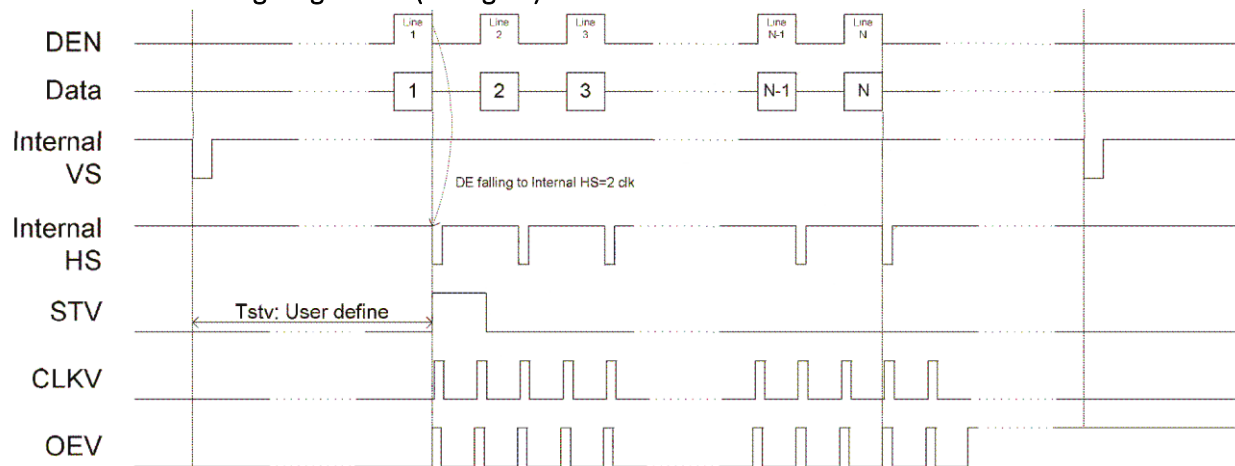
8 MODULE FUNCTION

8.1 PIN DESCRIPTION

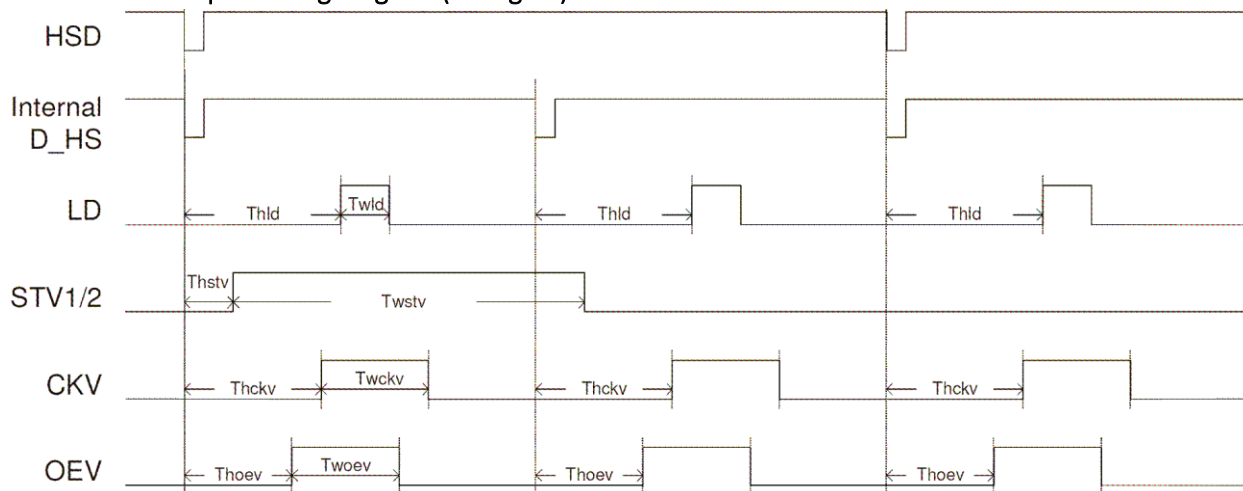
Pin Number	Pin Name	Functions
1	VDD	Power supply
2	VSS	Ground
3	B0	Blue data
4	B1	Blue data
5	B2	Blue data
6	B3	Blue data
7	B4	Blue data
8	VSS	Ground
9	G0	Green data
10	G1	Green data
11	G2	Green data
12	G3	Green data
13	G4	Green data
14	G5	Green data
15	VSS	Ground
16	R0	Red data
17	R1	Red data
18	R2	Red data
19	R3	Red data
20	R4	Red data
21	VSS	Ground
22	DCLK	Clock signal
23	VSS	Ground
24	HSYNC	Horizontal sync signal
25	VSS	Ground
26	VSNC	Vertical sync signal
27	VSS	Ground
28	DE	Data enable
29	LED_K	Cathode, Backlight LED
30	LED_A	Anode, Backlight LED

8.2 TIMING CHARACTERISTICS

8.2.1 Vertical Timing Diagram DE (Dual gate)

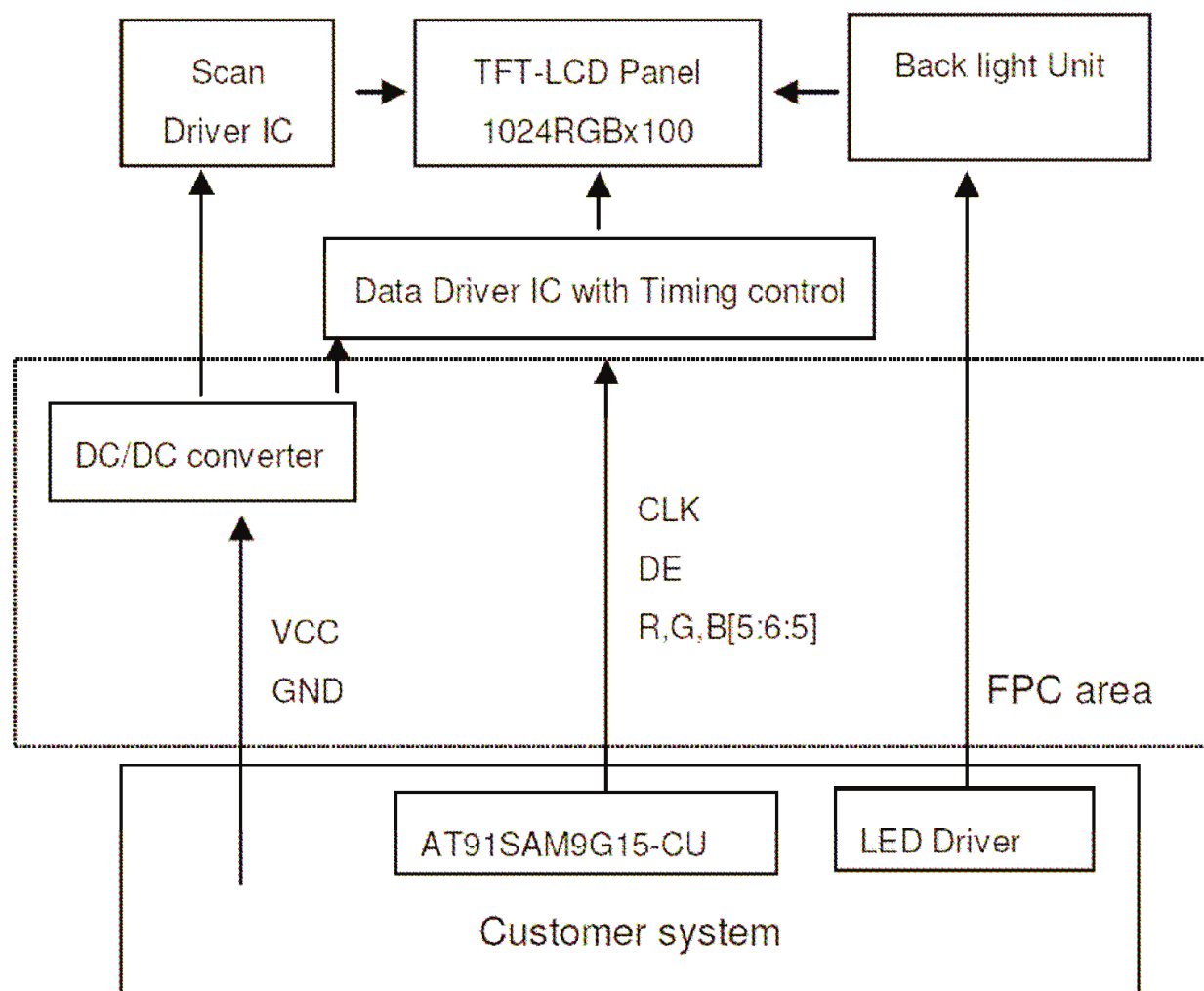


8.2.2 Gate Output Timing Diagram (Dual gate)



Parameter	Symbol	1024*RGB*130			Unit
		Spec.			
		Min.	Typ.	Max.	
DCLK Frequency	fclk		25		MHz
Horizontal Display Area	thd	1024			D CLK
HSD Period	th		1344		D CLK
HSD Blanking	thb+thfp		320		D CLK
Vertical Display Area	tvd	130			T _H
VSD Period	tv		310		T _H
VSD Blanking	tvbp+tvfp		180		T _H

8.3 BLOCK DIAGRAM



9 ELECTRO-OPTICAL CHARACTERISTICS

The following items are measured under stable conditions. The optical characteristics should be measured in dark room or equivalent state with the methods shown in Note 1 below

9.1 OPTICAL CHARACTERISTIC

LED backlight transmissive module:

Item	Symbol	Temp.	Min.	Typ.	Max.	Unit	Conditions
Response Time	$T_R + T_F$	25°C	-	25	50	ms	$\theta = 0^\circ$, $\phi = 0^\circ$ (Note 2)
Contrast Ration	CR	25°C	200	300	-	-	$\theta = 0^\circ$, $\phi = 0^\circ$ LED: ON, LIGHT: OFF (Note 3)
Brightness	L		200	250	-	cd/m ²	
Viewing Angle	Degree		60/50/60/60				CR≥10

12"/6"/9"/3"					(Note 4)
--------------	--	--	--	--	----------

9.2 CIE(x, y) CHROMATICITY

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
CIE color Coordinates	White	Wx	0.287	0.337	0.387	BM5; 2° angle (Note 5)
		Wy	0.298	0.348	0.398	
	Red	Rx	0.528	0.578	0.628	
		Ry	0.283	0.333	0.383	
	Green	Gx	0.343	0.393	0.443	
		Gy	0.493	0.543	0.593	
	Blue	Bx	0.108	0.158	0.208	
		By	0.092	0.142	0.192	
NTSC	39				%	

9.3 NOTES

Note 1

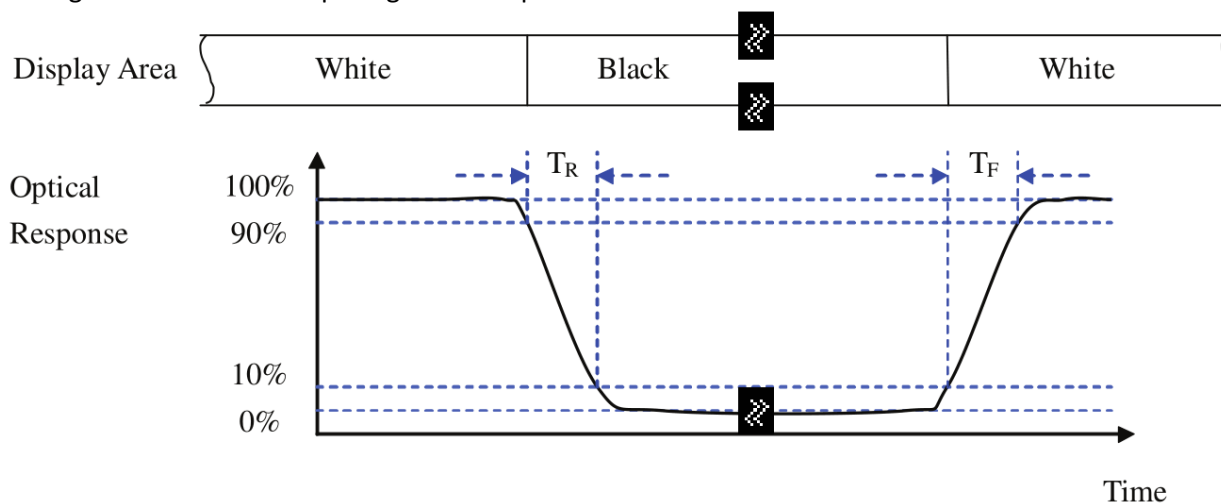
Test equipment setup

After stabilizing and leaving the panel alone at a given temperature for 30 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-5A with a viewing angle of 1° at a distance of 50cm and normal direction.

Note 2

Definition of response time: T_R and T_F

The figure below is the output signal of the photo detector.



Note 3

Definition of contrast ratio:

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

White $V_i = V_{i50\%} \pm 1.5V$

Black $V_i = V_{i50\%} \pm 2.0V$

"±" means that the analog input signal swings in phase with VCOM signal.

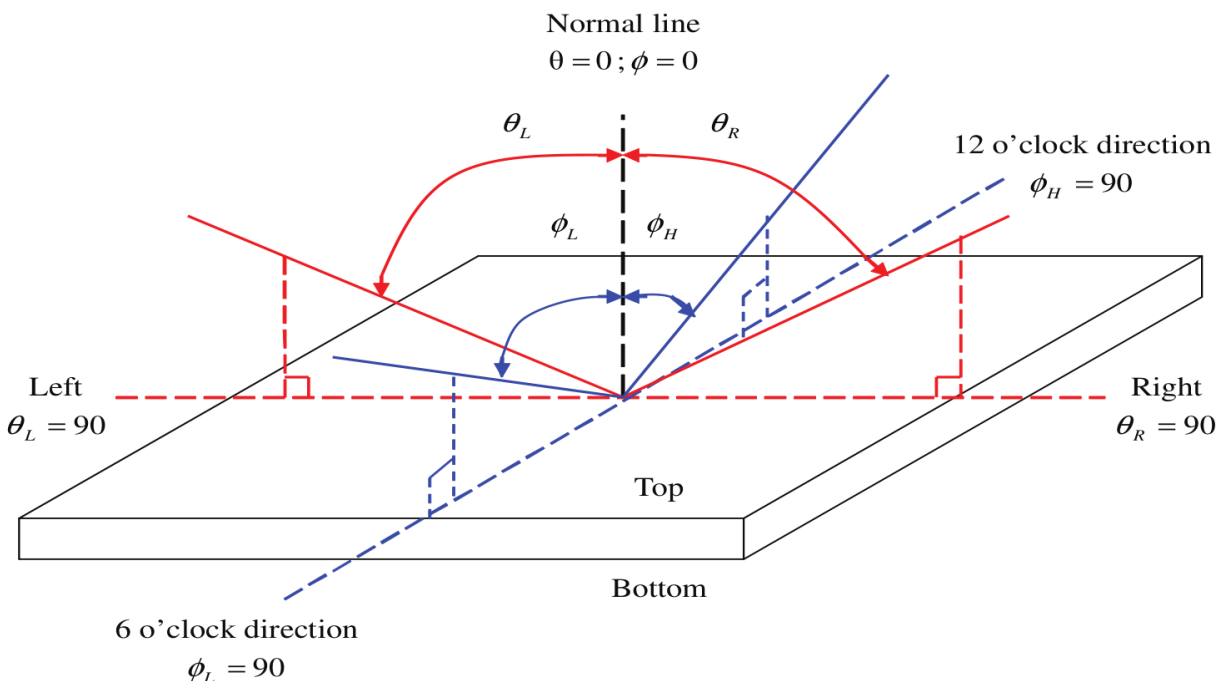
"μ" means that the analog input signal swings out of phase with VCOM signal.

$V_{i50\%}$: The analog input voltage when transmission is 50%.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 4

Definition of viewing angle:



Note 5

Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

10 RELIABILITY

10.1 MTTF

The LCD module shall be designed to meet a minimum MTTF value of 50,000 hours with normal condition. (25° C in the room without sunlight; not include life time of backlight)

10.2 TESTS

No	Item	Condition	Criterion
1	High Temperature Operating		No defect of operational function in room temperature are allowable (23±5°C).
2	Low Temperature Operating		
3	High Temperature Non-Operating		

4	Low Temperature Non-Operating		Leakage current should be below double of initial value.
5	High Temperature/Humidity Non-Operating	50°C : 90%RH : 240hrs	
6	Temperature Shock Non-Operating	-20°C $\longleftrightarrow$ 70°C (60min) (5min) (60min) 10 Cycles	
7	Electro-static Discharge (IEC 61000-4-2)	HBM: ± 2 kv	

Testing Notes:

- Test after 24 hours in room temperature.
- The sampling above is individually for each reliability testing condition.
- The color fading of polarizing filter should not care.
- All of the reliability testing chamber above, is using D.I. water.(Min value:1.0 MΩcm)
- In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.

10.3 COLOR PERFORMANCE

Number	Item	Criterion (initial)
1	Luminance	>50%
2	NTSC	>70%
3	Contrast Ratio	>50%

11 INSPECTION CRITERIA

11.1 INSPECTION CONDITIONS

11.1.1 Environmental conditions

The environmental conditions for inspection shall be as follows:

Room temperature: $23 \pm 5^\circ \text{C}$

Humidity: $50 \pm 20\% \text{RH}$

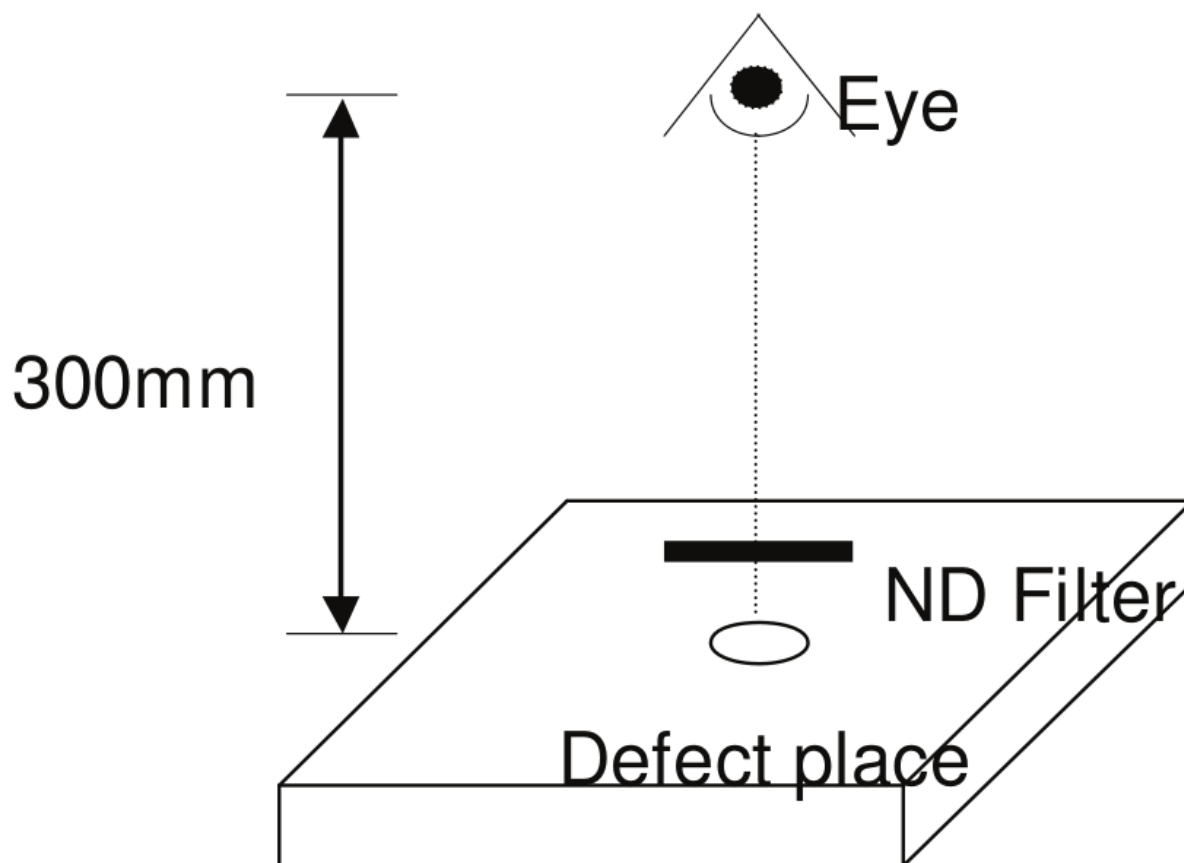
11.1.2 The external visual inspection

With a single 1000 ± 200 lux fluorescent lamp as the light source, the inspection was in the distance of 30cm or more from the LCD to the inspector's eyes

11.2 LIGHT METHOD

Environment lamp under 1000 ± 200 lux, Viewing direction for inspection over 30cm.

The distance from eye to defect around 300mm, the distance from ND Filter to defect around 25~30mm.



11.3 CLASSIFICATION OF DEFECTS

11.3.1 Major defect

A major defect refers to a defect that may substantially degrade usability for product applications.

11.3.2 Minor defect

A minor defect refers to a defect which is not considered to be able substantially degrade the product application or a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation.

Note: if the LCD/LCM's cosmetic and display performance do not specify in "inspection criterion," it should be based on these delivered samples.

11.4 SAMPLING & ACCEPTABLE QUALITY LEVEL

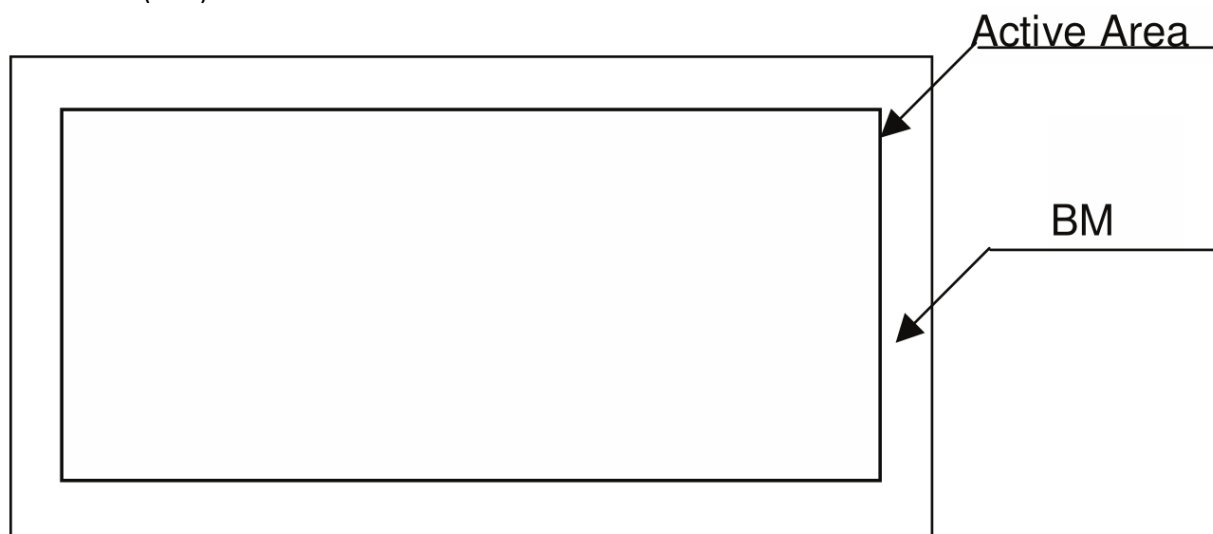
Level II, MIL-STD-105E

	Major	Minor
Cosmetic	1.0%	1.5%

Electrical-display	0.4%	0.65%
--------------------	------	-------

11.5 DEFINITION OF INSPECTION AREA

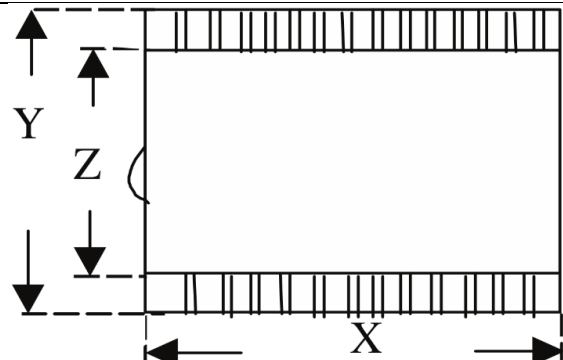
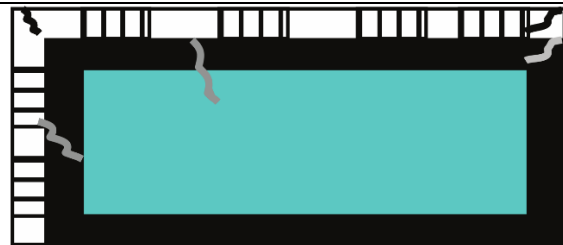
Active Area (A.A.)



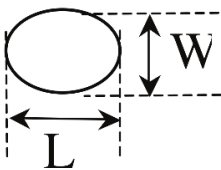
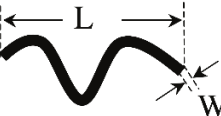
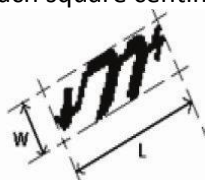
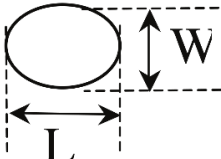
11.6 ITEM AND CRITERIA

11.6.1 Visual inspection criterion in cosmetic

Glass defect

No.	Defect	Criteria	Remark
1	Dimension (Major)	By engineering diagram	 The diagram shows a rectangular LCD panel with dimensions labeled X, Y, and Z. X is the width, Y is the height, and Z is the thickness. The panel is shown with a grid pattern on the top and bottom edges.
2	Cracks (Major)	Extensive crack [Reject]	 The diagram shows a rectangular LCD panel with a large, irregular crack running across the center. The panel is shown with a grid pattern on the top and bottom edges.

LCM appearance defect

No.	Defect	Criteria		Remark
1	Round type (Minor)	Spec.	Permissible Q'ty	1. $\phi=(L+W)/2$, L: Length, W: Width 2. Disregard if out of A.A. 3. Distance between two points >5mm 
		$\phi < 0.20\text{mm}$	Disregard	
		$0.20\text{mm} \leq \phi \leq 0.6\text{mm}$	4	
		$0.6\text{mm} < \phi$	0	
2	Scratch (Minor)	Spec.	Permissible Q'ty	1. L: Length, W: Width 2. Disregard if out of A.A. 3. No more than two lines in each square centimeter (cm^2) 
		$W \leq 0.02\text{mm}$ and $L \leq 15\text{mm}$	Disregard	
		$0.02\text{mm} < W \leq 0.1\text{mm}$ and $L \leq 15\text{mm}$	5	
		$W > 0.1\text{mm}$ or $L > 15\text{mm}$	0	
3	Fiber (Minor)	Spec.	Permissible Q'ty	1. L: Length, W: Width 2. Disregard if out of A.A. 3. No more than two lines in each square centimeter (cm^2) 
		$W \leq 1.5\text{mm}$ and $L \leq 2.0\text{mm}$	5	
		$W > 1.5\text{mm}$ or $L > 2.0\text{mm}$	0	
4	Polarizer Bubble/Dent (Minor)	Spec.	Permissible Q'ty	1. $\phi=(L+W)/2$, L: Length, W: Width 2. Disregard if out of A.A. 3. Distance between two points >5mm 4. No more than two lines in each square centimeter (cm^2) 
		$\phi < 0.30\text{mm}$	Disregard	
		$0.30\text{mm} \leq \phi \leq 0.6\text{mm}$	4	
		$0.6\text{mm} < \phi$	0	

FPC

No.	Defect	Criteria	Remark
1	Copper peeling (Minor)	Copper peeling [Reject]	

Black tape

No.	Defect	Criteria	Remark
1	Shift (Minor)	IC exposed [Reject]	
2	No black tape (Minor)	No black tape [Reject]	

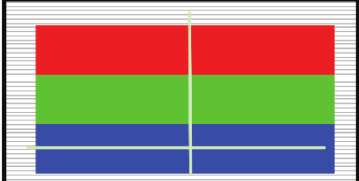
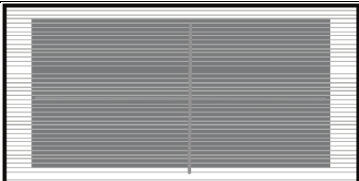
Silicon

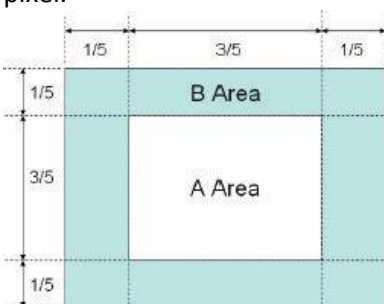
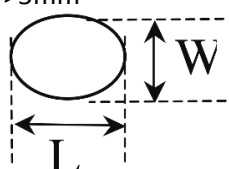
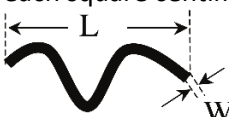
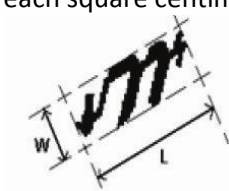
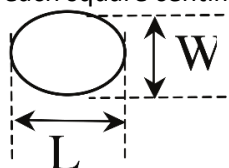
No.	Defect	Criteria	Remark
1	Amount of silicon (Minor)	ITO exposed [Reject]	

Bezel

No.	Defect	Criteria	Remark
1	Oxidized spot (Minor)	Oxidized sport, rust [Reject]	
2	Outline deformations (Minor)	By engineering diagram	
3	Greasiness (Minor)	Greasiness [Reject]	
4	Spots, round Type (Minor)	H≤By engineering diagram [Disregard]	H=Total height (thickness)
5	Plating (Minor)	Bubble, peeling [Reject]	

11.6.2 LCM electrical criterion

No	Defect	Criteria				Remark
1	No Display (Major)	Not allowed				
2	Missing line (Major)	Not allowed				
3	Darker or lighter line (Major)	Not allowed				
4	Bright/Dark point (Minor)		A Area	B Area	Total	1. 1 sub-pixel 2. Point defect area≥½ sub-
		Bright point	1	2	3	

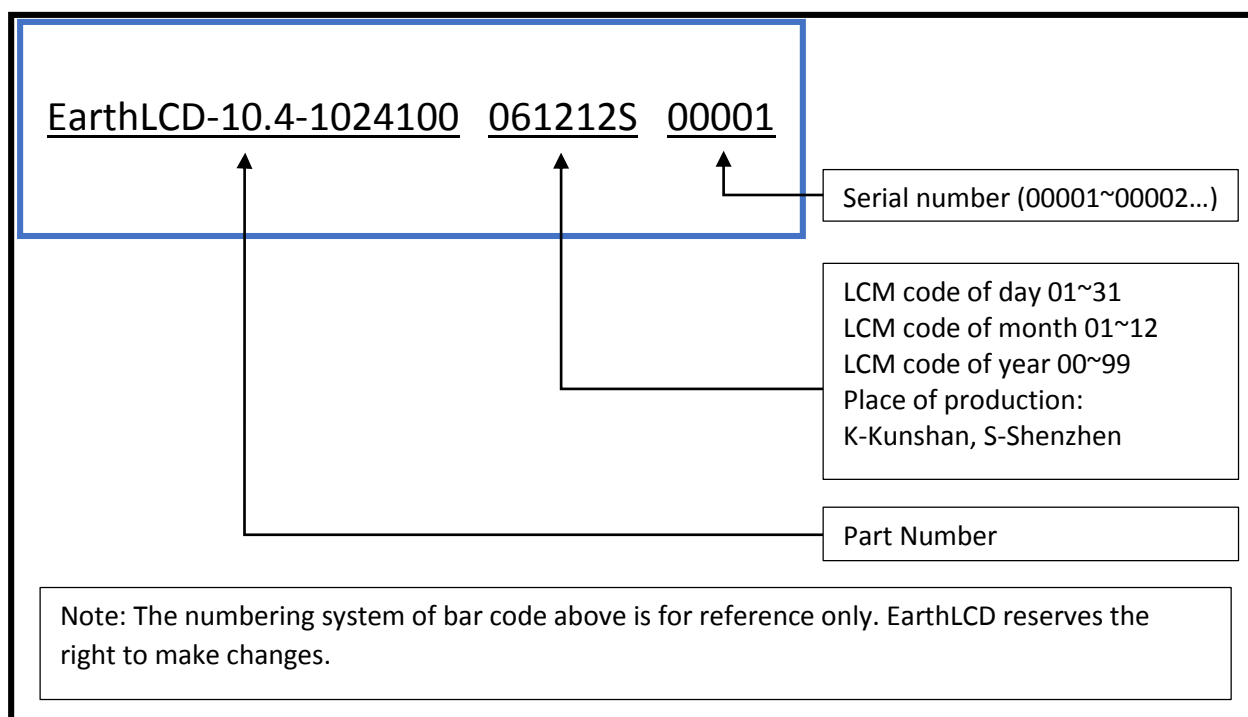
		Dark dot point	2	3	4	pixel. 
		Bright + Dark point	3	4	5	
1	Round type (Minor)	Spec.	Permissible Q'ty		1. $\phi=(L+W)/2$, L: Length, W: Width 2. Disregard if out of A.A. 3. Distance between two points >5mm 	
		$\phi<0.20\text{mm}$	Disregard			
		$0.20\text{mm}\leq\phi\leq0.6\text{mm}$	4			
		$0.6\text{mm}<\phi$	0			
2	Scratch (Minor)	Spec.	Permissible Q'ty		1. L: Length, W: Width 2. Disregard if out of A.A. 3. No more than two lines in each square centimeter (cm²) 	
		$W\leq0.02\text{mm}$ and $L\leq15\text{mm}$	Disregard			
		$0.02\text{mm}<W\leq0.1\text{mm}$ and $L\leq15\text{mm}$	5			
		$W>0.1\text{mm}$ or $L>15\text{mm}$	0			
3	Fiber (Minor)	Spec.	Permissible Q'ty		1. L: Length, W: Width 2. Disregard if out of A.A. 3. No more than two lines in each square centimeter (cm²) 	
		$W\leq1.5\text{mm}$ and $L\leq2.0\text{mm}$	5			
		$W>1.5\text{mm}$ or $L>2.0\text{mm}$	0			
4	Polarizer Bubble/Dent (Minor)	$\phi<0.30\text{mm}$	Disregard		1. $\phi=(L+W)/2$, L: Length, W: Width 2. Disregard if out of A.A. 3. Distance between two points >5mm 4. No more than two lines in each square centimeter (cm²) 	
		$0.30\text{mm}\leq\phi\leq0.6\text{mm}$	4			
		$0.6\text{mm}<\phi$	0			

5	Mura (Minor)	By 2% ND filter invisible	
---	-----------------	---------------------------	--

11.6.3 Others

1. Issues that are not defined in this document shall be discussed and agreed with both parties. (Customer and supplier)
2. Unless otherwise agreed upon in writing, the criteria shall be applied to both parties. (Customer and supplier)
3. Polarizer, more than 0.5mm in size reduction rejected.

12 ILLUSTRATION OF LCD BARCODE



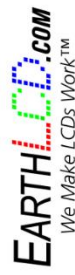
13 PACKAGE DRAWING

Package Order (1)~(10)		(1) TRAY No. : PLOM1307AC1 ② 180° REVERS Normal ① Order TRAY		(2) Order		(3) Static electricity bag		(4) Static electricity bag	
(5) EPE U Board		(6) EPE U Board		(7) EPE U Board		(8) EPE U Board		(9) EPE U Board	
(10) Package Quantity Products: 44 pcs/1 carton 1 Tray contain 4 pcs 11 contained trays, 1 empty tray		Package finished		Package finished		Package finished		Package finished	

NOTE:

1. Tape on the carton
2. Stored up the by 12 trays then put it in to the static electricity bag and seal it aswell

REVISD RECORD		SCALE	TOLERANCE	ORG DATE	05.29.12
A	B	UNIT	mm	DRAWN BY	wen
C	D	MATERIAL	FINISH	CHECKED BY	CONCURRED BY
E				APPROVED BY	



EARTH LCD .com
We Make LCDs Work™

14 ROHS COMPLIANT WARRANTY

RoHs Hazardous substances including:

- Cd < 100 ppm
- Pb < 1000 ppm
- Hg < 1000 ppm
- Cr+6 < 1000 ppm
- PBDE < 1000 ppm
- PBB < 1000 ppm

15 PRECAUTIONS FOR USE

15.1 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.

15.2 STORAGE CONDITIONS

- (1) Store the panel or module in a dark place where the temperature is $23\pm5^{\circ}\text{C}$ and the humidity is below $50\pm20\%\text{RH}$.
- (2) Store in anti-static electricity container.
- (3) Store in clean environment, free from dust, active gas, and solvent.
- (4) Do not place the module near organics solvents or corrosive gases.
- (5) Do not crush, shake, or jolt the module.
- (6) Do not exposed to direct sun light of fluorescent lamps.

15.3 INSTALLING LCD MODULE

Attend to the following items when installing the LCM:

- (1) Cover the surface with a transparent protective plate or touch panel to protect the polarizer and LC cell.
- (2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be $\pm 0.1\text{mm}$.

15.4 PRECAUTIONS FOR OPERATION

- (1) Viewing angle varies with the change of liquid crystal driving voltage (V_o). Adjust V_o to show the best contrast.
- (2) Driving the LCD in the voltage above the limit will shorten its lifetime.

- (3) Response time is greatly delayed at temperature below the operating temperature range.
However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.
- (4) When turning the power on, input each signal after the positive/negative voltage becomes stable.
- (5) Do not apply water or any liquid on product which composed of T/P.

15.5 HANDLING PRECAUTIONS

- (1) Avoid static electricity which can damage the CMOS LSI; please wear the wrist strap when handling.
- (2) The polarizing plate of the display is very fragile. Please handle it very carefully.
- (3) Do not give external shock.
- (4) Do not apply excessive force on the surface; it may cause display abnormal.
- (5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- (6) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (7) Do not operate it above the absolute maximum rating.
- (8) Do not remove the panel or frame from the module.
- (9) Do not apply water or any liquid on product, which composed of T/P.

15.6 WARRANTY

- (1) The period is within 12 months since the date of shipping out under normal using and storage conditions.
- (2) The warranty will be voided in case of defect induced by customer.

16 REVISION HISTORY

Version	Remark	Date
A	Initial version	June 5, 2017