

TFT SPECIFICATION

Part Number	T123-19200720C-82A1
Size	12.3"
Resolution	1920 x 720
Brightness	1000 cd/m
Contrast	1000:1
Viewing Angle	85/85/85/85
Operating Temp.	-30 ~ 80°C

FOR ADDITIONAL INFORMATION
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Issue Date	Approved by (customer use)	Checked by	Prepared by

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1. GENERAL DESCRIPTION

The T123-19200720C-82A1 model is a Color TFT LCD supplied by USMP. This main Module has a 12.3 inch diagonally measured active display area with 1920(RGB) X 720 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 16.7M Color signal for each pixel. The T123-19200720C-82A1 has been designed to apply the interface method that enables low power, high speed, and high contrast. The T123-19200720C-82A1 is intended to support applications where thin thickness, wide viewing angle, low power are critical factors and graphic displays are important.

2. FEATURES

Display Mode	Transmissive Type
	TFT LCD, Normally Black
Display Format	RGB 1920(RGB) x 720 Strip type
Color	16.7M color
Interface	2 ports LVDS data bus ,24bit
Viewing Direction	All
Backlight type / color	LED / white * 60

3. MECHANICAL SPECIFICATION

3.1. LCM

Item	Specifications	Unit
Dimensional outline	330.0(W)×150.75(H)×18.13(D)*	mm
Resolution	1920(R,G,B)×720	dot
Active area	292.032(W)×109.512(H)	mm
Pixel pitch	0.1521(W)×0.1521(H)	mm

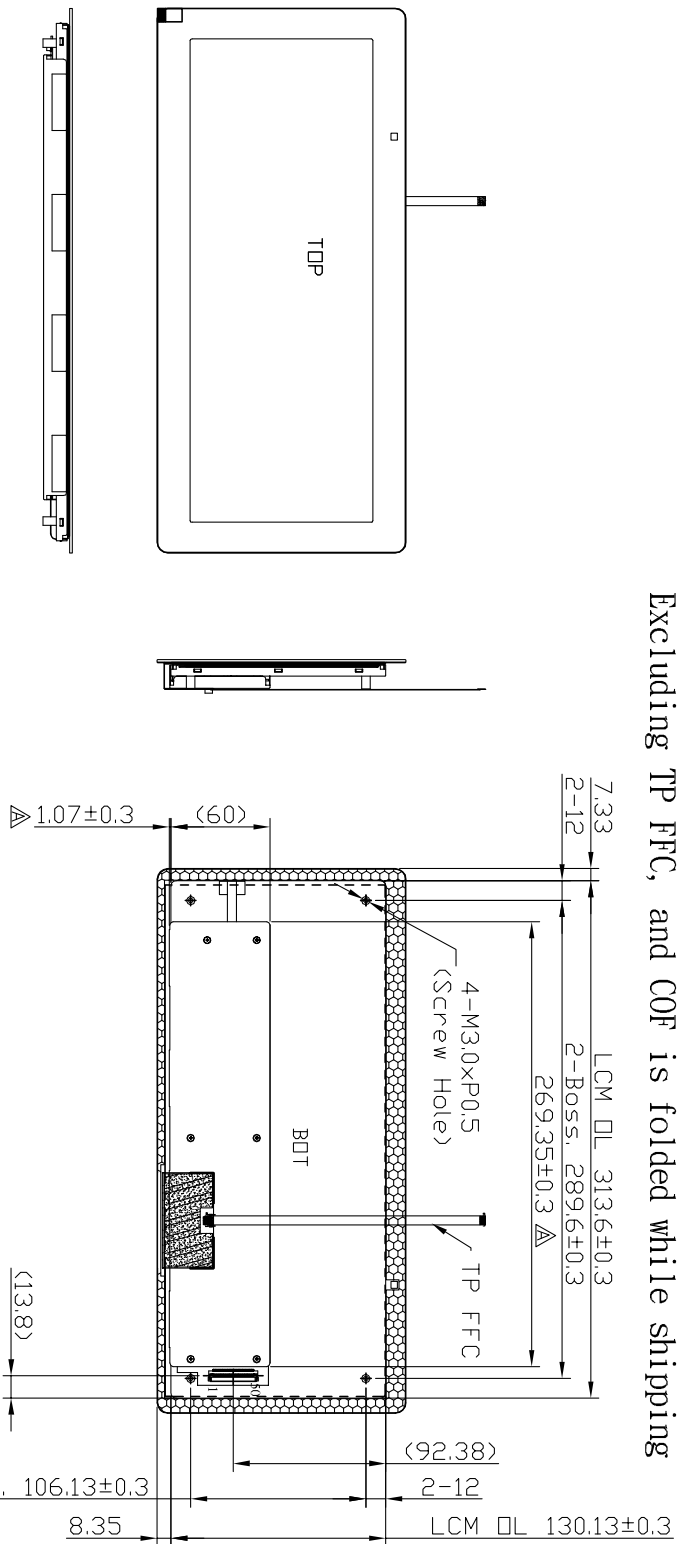
* Exclude FPC, Have include polarizer

3.2. Capacitive Touch Panel

Item	Contents	Unit
Type	Transparent Type Projective Capacitive Touch Panel	
Input Mode	Finger , 2 point	
Structure	Single sides ITO sensor glass with glass cover	
IC	EXI3160	
Cover outline	330.0 x 150.75	mm
TP AA	294.032 x 111.512	mm
Cover VA	293.032 x 110.512	mm
TP thickness	0.7± 0.05	mm
Cover thickness	2.0± 0.2	mm
PSA thickness	0.25 ± 0.02	mm
Total thickness	3.2± 0.5	mm
Surface Treatment	AG(Etching)	
Interface	USB 、I ² C	
Salt Water Proof	Up to 3.5% salt concentration*	
Nominal finger size (diam.)	8	mm
Accuracy center	±2.5	mm
Accuracy edge	±3.0	mm
Finger separation (center to center)	20	mm
Transmittance	> 85%	
Palm rejection	Yes	
Report rate	100	Hz

*Note: Spraying droplet on the sensing area by handheld sprayer without any ghost points.

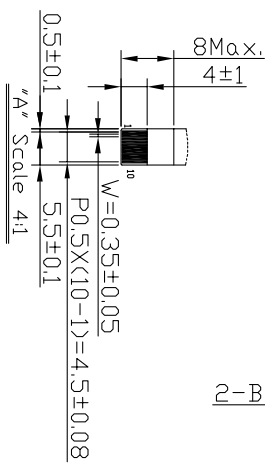
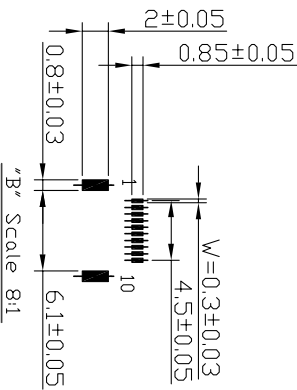
Excluding TP FFC, and COF is folded while shipping



Pin	Symbol	Function	Pin	Symbol	Function
1	VDD	Power (+3.0V)	11	TP	TP FFC
2	VDD	Power (+3.0V)	12	TP	TP FFC
3	VDD	Power (+3.0V)	13	TP	TP FFC
4	VDD	Power (+3.0V)	14	TP	TP FFC
5	VDD	Power (+3.0V)	15	TP	TP FFC
6	VDD	Power (+3.0V)	16	TP	TP FFC
7	VDD	Power (+3.0V)	17	TP	TP FFC
8	VDD	Power (+3.0V)	18	TP	TP FFC
9	VDD	Power (+3.0V)	19	TP	TP FFC
10	VDD	Power (+3.0V)	20	TP	TP FFC
21	VDD	Power (+3.0V)	22	TP	TP FFC
23	VDD	Power (+3.0V)	24	TP	TP FFC
25	VDD	Power (+3.0V)	26	TP	TP FFC
27	VDD	Power (+3.0V)	28	TP	TP FFC
29	VDD	Power (+3.0V)	30	TP	TP FFC
31	VDD	Power (+3.0V)	32	TP	TP FFC
33	VDD	Power (+3.0V)	34	TP	TP FFC
35	VDD	Power (+3.0V)	36	TP	TP FFC
37	VDD	Power (+3.0V)	38	TP	TP FFC
39	VDD	Power (+3.0V)	40	TP	TP FFC
41	VDD	Power (+3.0V)	42	TP	TP FFC
43	VDD	Power (+3.0V)	44	TP	TP FFC
45	VDD	Power (+3.0V)	46	TP	TP FFC
47	VDD	Power (+3.0V)	48	TP	TP FFC
49	VDD	Power (+3.0V)	50	TP	TP FFC
51	VDD	Power (+3.0V)	52	TP	TP FFC
53	VDD	Power (+3.0V)	54	TP	TP FFC
55	VDD	Power (+3.0V)	56	TP	TP FFC
57	VDD	Power (+3.0V)	58	TP	TP FFC
59	VDD	Power (+3.0V)	60	TP	TP FFC
61	VDD	Power (+3.0V)	62	TP	TP FFC
63	VDD	Power (+3.0V)	64	TP	TP FFC
65	VDD	Power (+3.0V)	66	TP	TP FFC
67	VDD	Power (+3.0V)	68	TP	TP FFC
69	VDD	Power (+3.0V)	70	TP	TP FFC
71	VDD	Power (+3.0V)	72	TP	TP FFC
73	VDD	Power (+3.0V)	74	TP	TP FFC
75	VDD	Power (+3.0V)	76	TP	TP FFC
77	VDD	Power (+3.0V)	78	TP	TP FFC
79	VDD	Power (+3.0V)	80	TP	TP FFC
81	VDD	Power (+3.0V)	82	TP	TP FFC
83	VDD	Power (+3.0V)	84	TP	TP FFC
85	VDD	Power (+3.0V)	86	TP	TP FFC
87	VDD	Power (+3.0V)	88	TP	TP FFC
89	VDD	Power (+3.0V)	90	TP	TP FFC
91	VDD	Power (+3.0V)	92	TP	TP FFC
93	VDD	Power (+3.0V)	94	TP	TP FFC
95	VDD	Power (+3.0V)	96	TP	TP FFC
97	VDD	Power (+3.0V)	98	TP	TP FFC
99	VDD	Power (+3.0V)	100	TP	TP FFC

Display Scale 200:1

- NOTES :
1. Silicone applied to cover whole pin surface, but NOT IC.
 2. The Dimension In Brackets() are For reference only.
 3. M3.0xP0.5 Screw Holes Are Allowed Screw Torque of System : 0.0 kgf.cm Max.
 4. LCM Connector : FH28-50S-0.5SH
 5. TP FFC shipped with the product, no assembly
 6. Cover Lens Etching At Class 80 \pm 15 μ m



Pin	Symbol	Function
1	VDD	Power (+3.0V)
2	VDD	Power (+3.0V)
3	VDD	Power (+3.0V)
4	VDD	Power (+3.0V)
5	VDD	Power (+3.0V)
6	VDD	Power (+3.0V)
7	VDD	Power (+3.0V)
8	VDD	Power (+3.0V)
9	VDD	Power (+3.0V)
10	VDD	Power (+3.0V)

REVISED RECORD	CR Number	SCALE	1/4	TOLERANCE	UNIT	mm	ORG DATE	10.18.16	PROJECT NO:	MODULE:	CONCURRED BY	DWG NO	P 2 OF 2	VERSION
Modify PIN Define & Notes & Tolerance	CR1616000298			±0.2										
Cancel TTT & POL & TP AA Dimension	CR1616000299													
Cancel TTT & POL & TP AA Dimension	CR1616000436													
Modify TP DL dimension	CR1616000457													
Modify as show														

5. MAXIMUM RATINGS

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

Items	Symbol	Min.	Max.	Unit	Note
Power Voltage	VDD	3.0	3.6	Volt	
Operating Temperature	Top	-40	85	°C	Ambient temperature
Storage Temperature	Tst	-40	90	°C	Ambient temperature
Humidity	-	-	90	%RH	Note 1)

Note :

1) Note1: HTHE +65°C + 4°C, %RH : 93% + /- 5%

6. ELECTRICAL CHARACTERISTICS

A. Typical operating conditions

Item		Symbol	Values			Unit	Remark
			Min.	Typ.	Max.		
Supply Voltage for Source Driver		VDD	3.0	3.3	3.6	V	
Output Voltage	H level	V _{OH}	VDD-0.4		VDD	V	
	L Level	V _{OL}	VSS		VSS+0.4	V	
Input Voltage	H level	V _{IH}	0.7*VDD	-	VDD	V	
	L Level	V _{IL}	VSS	-	0.3*VDD	V	
Frame Rate		Fr		60		Hz	

7. Backlight Characteristics

Item	Symbol	Values			Unit	Test condition
		Min.	Typ.	Max.		
LED Current(per chain)	I _{AK}		(80)	(120)	mA	
LED Voltage	V _{AK}	---	(34)	(50)	V	
LCM Surface Luminance	L _s	800	1000		Cd/m ²	
Power consumption			(16)		W	
LCM Surface brightness uniformity	L _D	70			%	
Number of LED		60			pcs	
Connection mode	P	6Parallel/10Serial				
LED life time		50000				I _{AK} =90mA/chain, 25°C L50%

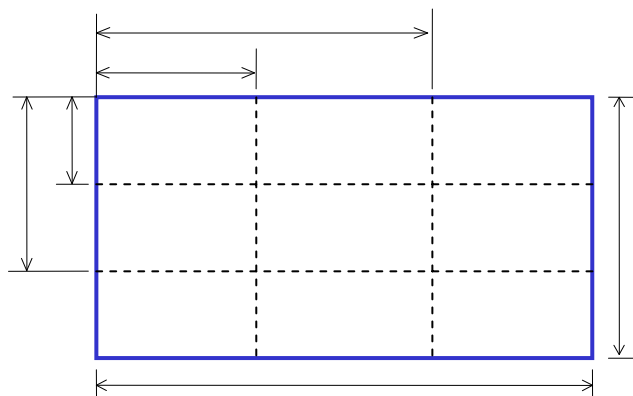
Note:

- 1.GP suggest using constant current driving this backlight unit .
- 2.The LED chip luminance decrease to be 50% of original

- a. Test Instrument: BM-7 (Distance =500mm; Field = 1°)
- b. Light Source: LED * 60 (White)
- c. Measure Brightness: 1 ~ 9
- d. Uniformity = (Min. Brightness / Max. Brightness)*100%
- e. Uniformity ≥ 70%

Note :

The maximum difference between LED voltages |(A1-K1)-(A2-K2)| of a single display shall be less than 1.0 V @ 20 mA .



8. MODULE FUNCTION DESCRIPTION

8.1. LCM PIN Description

Pin	Symbol	I/O	Function
1	GND	P	System Ground
2	VDD	P	System Power(3.3V)
3	VDD	P	System Power(3.3V)
4	VDD	P	System Power(3.3V)
5	GND	P	System Ground
6	NTC1		Connected to NTC Thermistor in Backlight
7	WP	I	Write Protect for EEPROM
8	SCLK	I	Serial clock input for EEPROM
9	SDAT	I	Serial data input for EEPROM
10	AGMODE	I	Aging Mode
11	NTC2		Connected to NTC Thermistor in Backlight
12	GND	P	System Ground
13	OLV0N	I	LVDS Differential Data Pair
14	OLV0P	I	LVDS Differential Data Pair
15	GND	P	System Ground
16	OLV1N	I	LVDS Differential Data Pair
17	OLV1P	I	LVDS Differential Data Pair
18	GND	P	System Ground
19	OLV2N	I	LVDS Differential Data Pair
20	OLV2P	I	LVDS Differential Data Pair
21	GND	P	System Ground
22	OLVCLKN	I	LVDS Differential Clock Pair
23	OLVCLKP	I	LVDS Differential Clock Pair
24	GND	P	System Ground
25	OLV3N	I	LVDS Differential Data Pair
26	OLV3P	I	LVDS Differential Data Pair
27	GND	P	System Ground
28	ELV0N	I	LVDS Differential Data Pair
29	ELV0P	I	LVDS Differential Data Pair

30	GND	P	System Ground
31	ELV1N	I	LVDS Differential Data Pair
32	ELV1P	I	LVDS Differential Data Pair
33	GND	P	System Ground
34	ELV2N	I	LVDS Differential Data Pair
35	ELV2P	I	LVDS Differential Data Pair
36	GND	P	System Ground
37	ELVCLKN	I	LVDS Differential Clock Pair
38	ELVCLKP	I	LVDS Differential Clock Pair
39	GND	P	System Ground
40	ELV3N	I	LVDS Differential Data Pair
41	ELV3P	I	LVDS Differential Data Pair
42	GND	P	System Ground
43	LED(A)	P	LED_A Anode
44	LED(A)	P	LED_A Anode
45	LED(K)	P	LED_K Cathode
46	LED(K)	P	LED_K Cathode
47	LED(K)	P	LED_K Cathode
48	LED(K)	P	LED_K Cathode
49	LED(K)	P	LED_K Cathode
50	LED(K)	P	LED_K Cathode

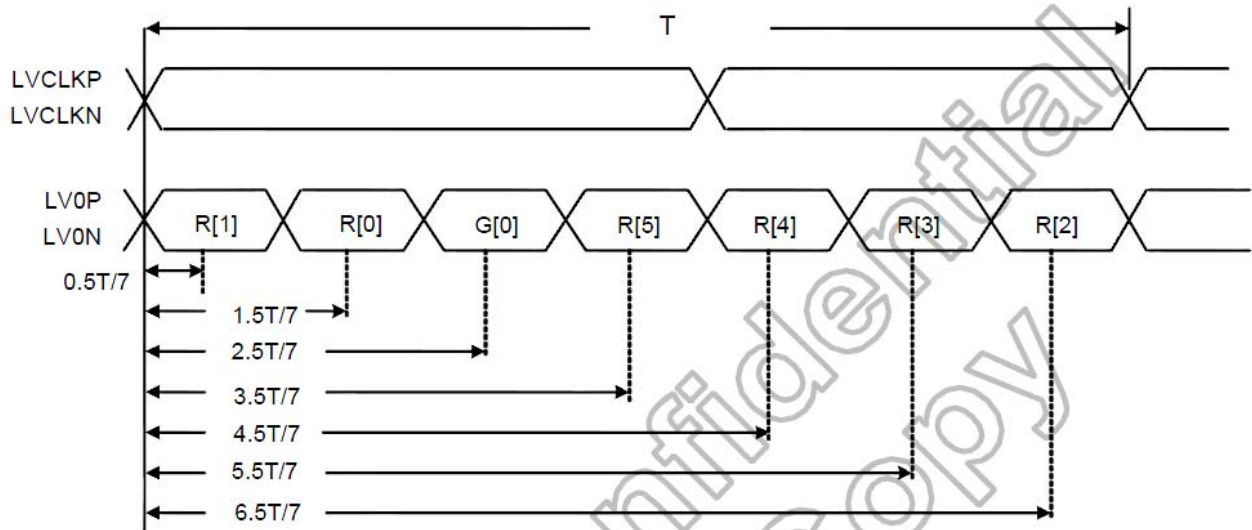
8.2. CTP PIN Description

1	GND	P	Digital Ground
2	DA-	I	USB D-
3	DA+	I	USB D+
4	V _{IN} (VDD_USB)	P	Digital Power (5V) for USB ($\pm 0.25V$)
5	V _{IN} (VDD_I2C)	P	Digital Power (3.3V~3.6V) for I2C
6	SDA	I	A serial data pin for I2C interface
7	SCL	I	A serial clock pin for I2C interface
8	INT	I	Interrupt output pin to host
9	RESET	I	Hardware reset pin
10	GND	P	Digital Ground

8.3. Timing characteristics

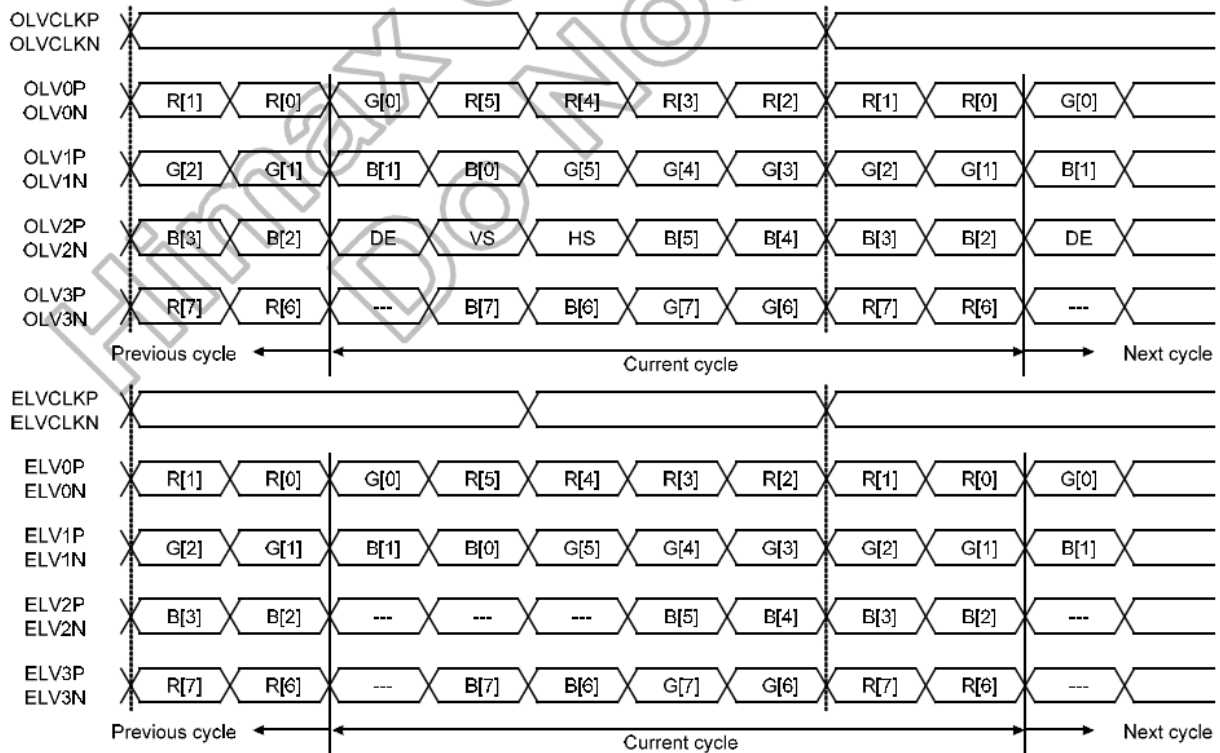
8.3.1. LVDS receiver

Ideal strobe position for LVDS input

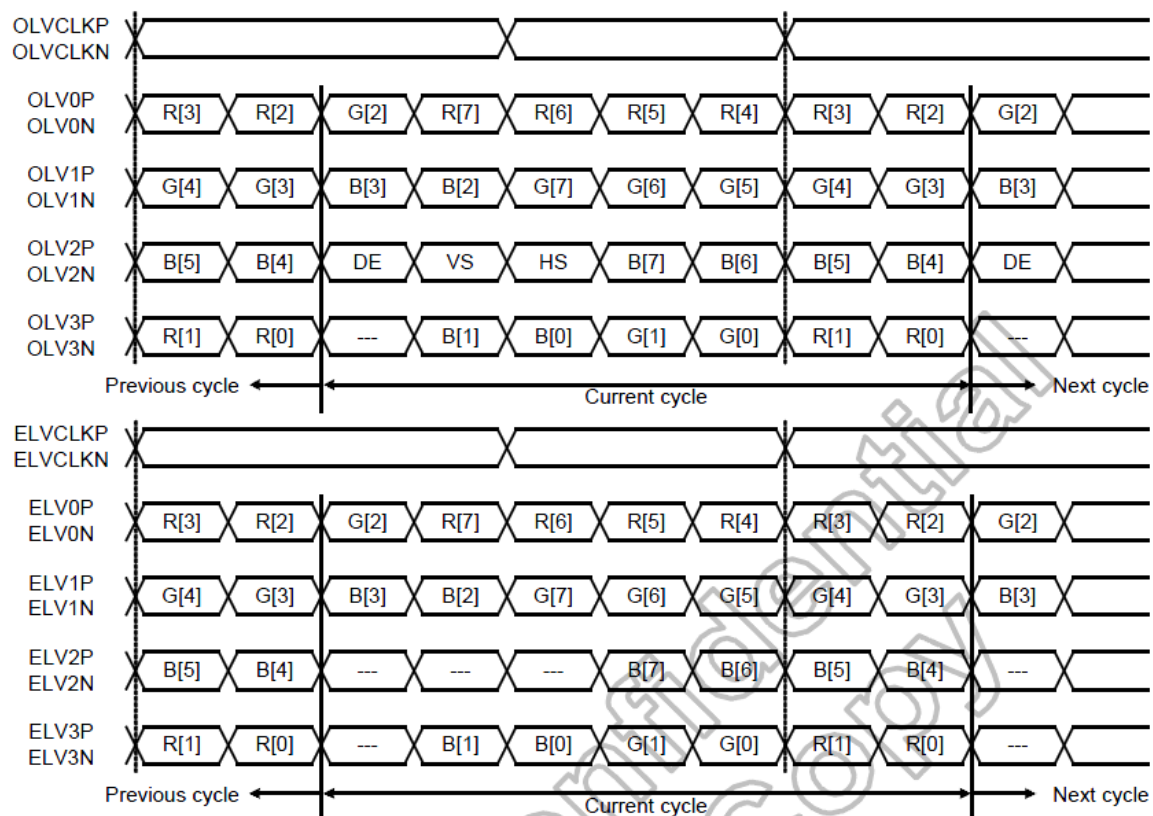


LVDS input data ideal storbe position

8.3.2. LVDS input data mapping



LVDS input data mapping(VESA format)



LVDS input data mapping(JEIDA format)

8.3.3.LVDS input port mirror by ROM code setting

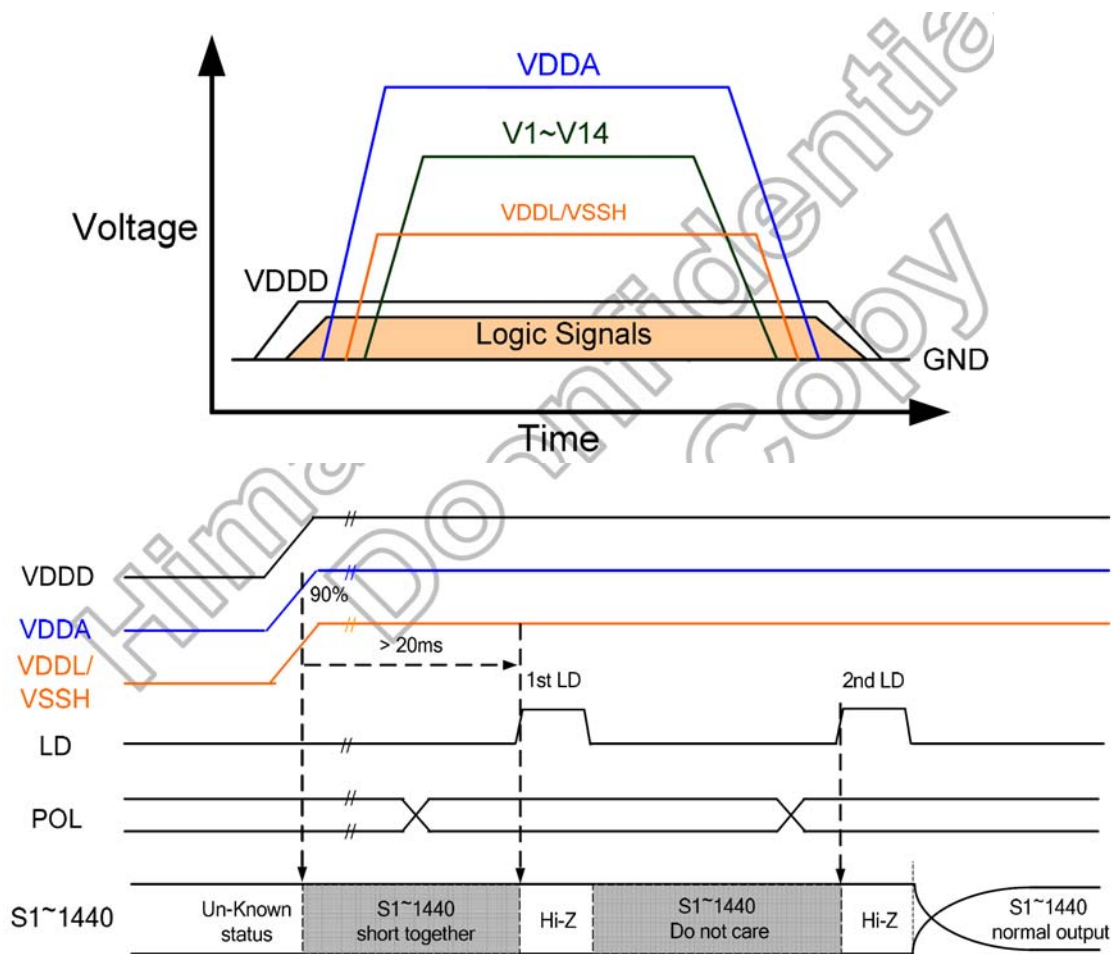
Type	0	1	2	3	4	5	6	7
Pin no.	Default	Port swap	Mirror	Mirror & port swap	Single1	Single2	Mirror & single1	Mirror & single2
7	OLV0N	ELV0N	OLV3P	ELV3P	LV0N	-	LV3P	-
8	OLV0P	ELV0P	OLV3N	ELV3N	LV0P	-	LV3N	-
9	OLV1N	ELV1N	OLVCLKP	ELVCLKP	LV1N	-	LVCLKP	-
10	OLV1P	ELV1P	OLVCLKN	ELVCLKN	LV1P	-	LVCLKN	-
11	OLV2N	ELV2N	OLV2P	ELV2P	LV2N	-	LV2P	-
12	OLV2P	ELV2P	OLV2N	ELV2N	LV2P	-	LV2N	-
13	OLVCLKN	ELVCLKN	OLV1P	ELV1P	LVCLKN	-	LV1P	-
14	OLVCLKP	ELVCLKP	OLV1N	ELV1N	LVCLKP	-	LV1N	-
15	OLV3N	ELV3N	OLV0P	ELV0P	LV3N	-	LV0P	-
16	OLV3P	ELV3P	OLV0N	ELV0N	LV3P	-	LV0N	-
19	ELV0N	OLV0N	ELV3P	OLV3P	-	LV0N	-	LV3P
20	ELV0P	OLV0P	ELV3N	OLV3N	-	LV0P	-	LV3N
21	ELV1N	OLV1N	ELVCLKP	OLVCLKP	-	LV1N	-	LVCLKP
22	ELV1P	OLV1P	ELVCLKN	OLVCLKN	-	LV1P	-	LVCLKN
23	ELV2N	OLV2N	ELV2P	OLV2P	-	LV2N	-	LV2P
24	ELV2P	OLV2P	ELV2N	OLV2N	-	LV2P	-	LV2N
25	ELVCLKN	OLVCLKN	ELV1P	OLV1P	-	LVCLKN	-	LV1P
26	ELVCLKP	OLVCLKP	ELV1N	OLV1N	-	LVCLKP	-	LV1N
27	ELV3N	OLV3N	ELV0P	OLV0P	-	LV3N	-	LV0P
28	ELV3P	OLV3P	ELV0N	OLV0N	-	LV3P	-	LV0N

9. POWER ON/OFF SEQUENCE

Special care should be taken that the large current may cause a permanent damage to the LSI when voltage is applied to the LCD drive power supply terminals in the condition that the logic power supply terminals are floating.

9.1. Power Supply NO/OFF Sequence

The following sequences are recommended from the image display to the power supply OFF.



10.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.

Parameter		Symbol	Min.	Typ.	Max.	Units	Note
Luminance of white		Lwh	800	1000	-	cd/m ²	3
Contrast Ratio		CR	700	1000	-	-	5
CIE color Coordinates	White	x		(0.283)		-	BM7; 2° angle
		y		(0.305)			
	Red	x		(0.645)			
		y		(0.327)			
	Green	x		(0.268)			
		y		(0.603)			
	Blue	x		(0.135)			
		y		(0.122)			
NTSC				(70)		%	
Response Time		Tr+Tf	---	25	40	ms	4 25°C
Viewing Angle (with Polarizer)	Y axis down (ψ=180°)	ϕ _L	80	85	---	Degree	5
	Y axis up (ψ=0°)	ϕ _H	80	85	---		
	X axis right (ψ=90°)	θ _R	80	85	---		
	X axis left (ψ=270°)	θ _L	80	85	---		

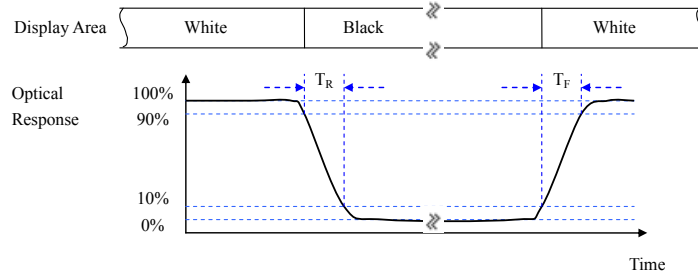
Note:

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-5(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

2. Definition of response time: T_R and T_F

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



3. Definition of contrast ratio:

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

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

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

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

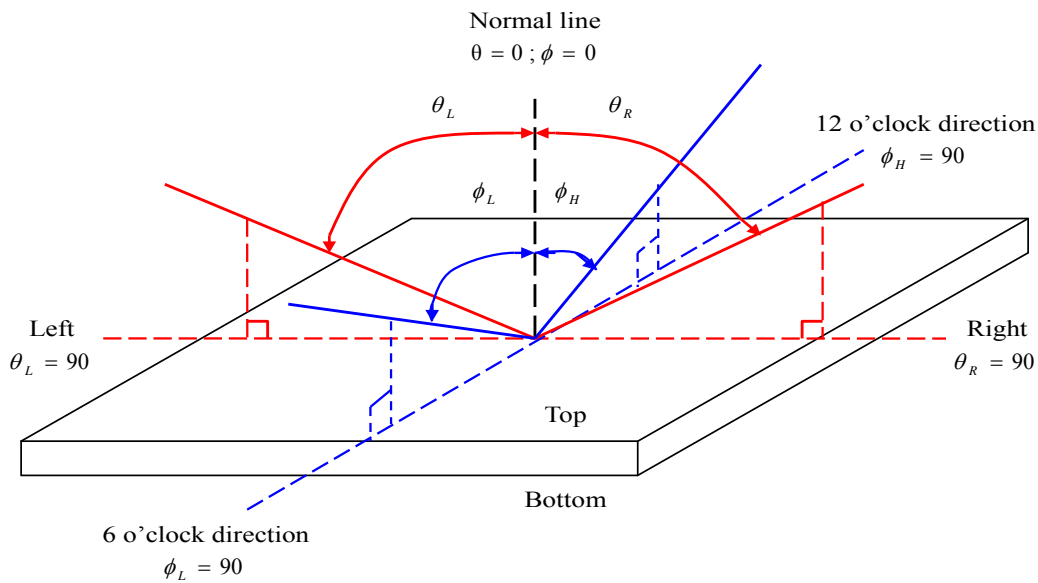
" \mp " means that the analog input signal swings out of phase with VCOM signal.

$V_{i50\%}$: 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.

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

5. Definition of viewing angle:



CTP OPTICAL CHARACTERISTIC

Item	Specifications	Remark
Transparency	$\geq 85\%$ @wave length 550nm	Note 1
Haze	$\leq 6.5\%$	

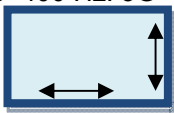
Note 1 : After stabilizing the panel, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by NIPPON NDH-5000.

11.RELIABILITY

11.1.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)

11.2.TESTS

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Operating	+80°C 240 hrs	<ul style="list-style-type: none"> No defect of Electronics Function In Room Temperature Are Allowable. IDD of LCD in Pre-and post-test should follow specification
2	Low Temperature Operating	-30°C 240 hrs	
3	High Temperature Non-Operating	+80°C 240 hrs	
4	Low Temperature Non-Operating	-30°C 240 hrs	
5	High Temperature/ Humidity Operating	+60°C ,90%RH ,500hrs	
6	Temperature Shock Non-Operating	-30°C \longleftrightarrow 80°C (30min) (5min) (30min) 50cycles, 500 cycles, (Only Soldering, Sn no Creak)	
7	Vibration (TBD, ES1 Check)	Sinewave 8~33.3 Hz: 1.3mm 33.3~400 Hz: 3G 	
8	Electrostatic Discharge Test Non-Operating	HBM: ±2kV	
9	Vibration (Non-operation)	Sinewave 8~33.3 Hz: 1.3mm 33.3~400 Hz: 3G Duration : 4 hours for each direction	
10	Mechanical Shock	100G, 6ms, ±X,±Y,±Z Duration : 3 times for each direction Reference : IEC68-2-27Ea	

11	Q-sun Test	Lamp: Xenon-Arc Filter: Daylight Irradiance: 0.68W/m ² /nm at 340 nm Exposure Cycle: 102 minutes light at 65 °C Black Standard Temperature; 18 minutes light and water spray. Duration : 1000 hours Reference : ISO4892-2	
12	Salt Fog Test	1. Temp. of the chamber:35°C 2. Temp. of the saturation tower: 47°C 3. Liquor: 5% NaCl (by weight) 4. PH value of the liquor:6.5 (25C°) Duration : 360 hours	
13	Solar Radiation	Solar Radiation Standard: MIL-STD-810G Test Overview: Expose Front Side of sample to solar radiation using the test parameters stated. Test Parameters: Source Intensity: 1120W/m ² ± 10% Test Cycle: 24 hr. cycle consisting of: 20 hr. irradiation at indicated source intensity. 1 hour of dark and water spray on front. 3 hours of dark at 95% RH. Number of Cycles: 56 Maximum Chamber Temp.: +49°C. Periodic Monitoring: (56 Cycle Test) Evaluate all three samples every 7 cycles for degradation comparison and to be photographed. The photograph to be sent to us for review by the time the report is available. Pass/Fail Criteria: To pass, all samples must be free from any external signs of deterioration or water intrusion. Very slight fading is allowed on samples returned at the end of exposure. Reference : MIL-STD-810G	

Note 1: Test after 24 hours in room temperature.

Note 2: The sampling above is individually for each reliability testing condition.

Note 3: The color fading of polarizing filter should not care.

Note 4: All of the reliability testing chamber above, is using D.I. water. (Min value: 1.0 MΩ-cm)

Note 5: In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after software resetting, it would be judged as a good part.

11.3. Color performance

No.	ITEM	Criterion (initial)
1	Luminance	>50%
2	NTSC	>50%
3	Contrast Ratio	>50%

12.INSPECTION CRITERIA

12.1.Inspection Conditions

12.1.1.Environmental conditions

The environmental conditions for inspection shall be as follows

Room temperature: $23\pm5^{\circ}\text{C}$

Humidity: $50\pm20\%\text{RH}$

12.1.2.The external visual inspection

With a single $1000\pm200\text{lux}$ fluorescent lamp as the light source, the inspection was in the distance of 30cm or more from the LCD to the inspector's eyes.

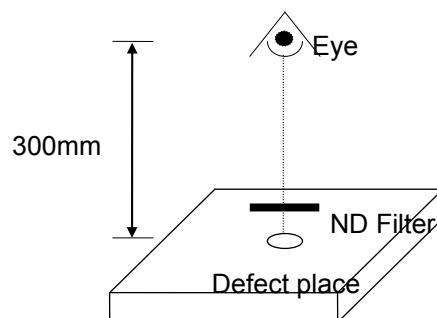
12.2.Light Method

12.2.1.Environment lamp under $1000\pm200\text{ lux}$, Viewing direction for inspection over 30

cm

12.2.2.The distance from eye to defect around 300mm, the distance from ND Filter to

defect around 25~30mm



12.3. Classification Of Defects

12.3.1. Major defect

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

12.3.2. 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.

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

12.4. Sampling & Acceptable Quality Level

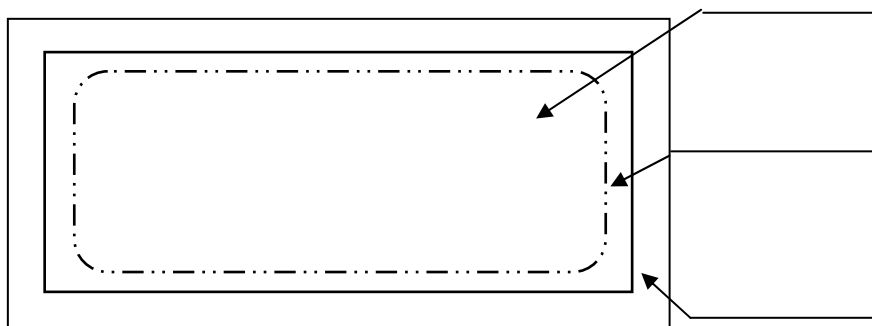
Level II, MIL-STD-105E

	Major	Minor
Cosmetic	1.0 %	1.5 %
Electrical-display	0.4%	0.65 %

12.5. Definition Of Inspection Area

V.A: Viewing Area

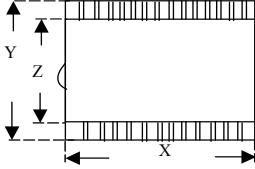
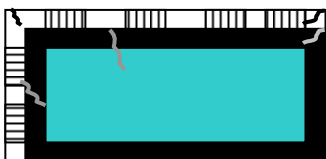
A.A: Active Area



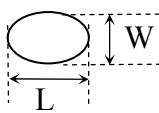
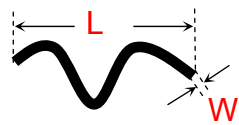
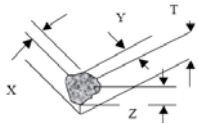
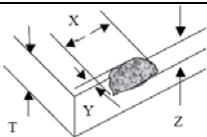
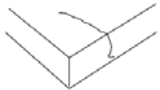
12.6.Items and Criteria

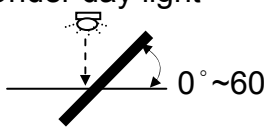
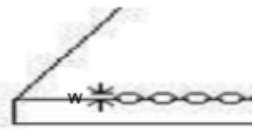
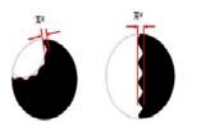
12.6.1.Visual inspection criterion in cosmetic

(1) Glass defect

No	Defect	Criteria	Remark
1	Dimension (Minor)	By engineering diagram	
2	Cracks (Major)	Extensive crack 【Reject】	

(2) LCM appearance defect with in V.A

No	Item	Criteria		Remark
1	Round type (Minor)	Spec.	Permissible Q'ty	1. $\phi = (L+W)/2$, L: Length, W: Width 2. Disregard if out of <u>V.A.</u> 
		$\phi < 0.20\text{mm}$	Disregard	
		$0.20\text{mm} \leq \phi \leq 0.60\text{mm}$	5	
		$0.60\text{mm} < \phi$	0	
2	Line type (Minor)	Defect Spec.	Permissible Q'ty	1: L: Length, W: Width 2: Disregard if out of <u>V.A.</u> 
		$W \leq 0.10\text{mm}$ and $L \leq 10\text{mm}$	Disregard	
		$L \leq 10\text{mm}$ and $0.10\text{mm} < W \leq 0.25\text{mm}$	4	
		$W > 0.25\text{mm}$ or $L > 10\text{mm}$	0	
3	Corner chip (Minor)	$X \leq 3.0\text{mm}$, $Y \leq 3.0\text{mm}$, $Z \leq T$ 【Disregard】		
4	Edge chip (Minor)	$X \leq 3.0\text{mm}$, $Y \leq 3.0\text{mm}$, $Z \leq T$ 【Disregard】		
5	Crack (Major)	Not allowed		

6	Newton's ring (Minor)	Defect Spec.	Permissible Q'ty	Under day light 
		$\phi \leq 7\text{mm}$	Disregard	
		$\phi > 7\text{mm}$	0	
7	Chipping (Minor)	$W \leq 0.2 \text{ mm}$	Disregard	
8	Saw edge (Minor)	$W \leq 0.3\text{mm}$	Disregard	
9	Ink peel off 、 Pin hole (Minor)	$\phi \leq 0.2\text{mm}$	Disregard	
		$\phi > 0.2\text{mm}$	0 (fix with print)	

(3) FPC

No	Defect	Criteria	Remark
1	Copper peeling (Major)	Copper peeling 【Reject】	

(4) Black tape

No	Defect	Criteria	Remark
1	Shift (Minor)	IC exposed 【Reject】	
2	No black tape (Minor)	No black tape 【Reject】	



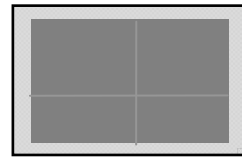
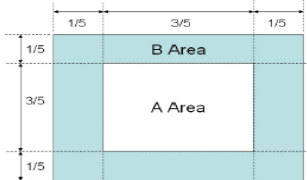
(5) Silicon

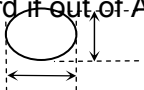

No	Defect	Criteria	Remark
1	Amount of silicon (Minor)	ITO exposed 【Reject】	

(6) Bezel

No	Defect	Criteria	Remark
1	Oxidized spot (Minor)	Oxidized spot, rust 【Reject】	
2	Outline deformation (Major)	By engineering diagram	
3	Greasiness (Minor)	Greasiness 【Reject】	
4	Spots, round Type (Minor)	$H \leq$ By engineering diagram 【Disregard】	H=Total height (thickness)
5	Plating (Minor)	Bubble, peeling 【Reject】	

12.6.2. Visual inspection criterion in electrical display

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	Weak line (Minor)	By limit sample		
5	Bright / Dark point (Minor)		Total	1.1sub-pixel: 1R or 1G or 1B 2.Point defect area $\geq 1/2$ sub pixel. 
		Bright point	2	
		Dark dot point	3	
		Bright +Dark point	4	
		Two adjacent dot	5	

6	Weak Bright point	can not see through 5% ND filter		
7	Round type (Minor)	Spec.	Permissible Q'ty	1. $\phi = (L+W)/2$, L: Length, W: Width 2. Disregard if out of A.A. 
		$\phi < 0.20\text{mm}$	Disregard	
		$0.20\text{mm} \leq \phi \leq 0.60\text{mm}$	6	
		$0.60\text{mm} < \phi$	0	
8	Line type (Minor)	Defect Spec.	Permissible Q'ty	1. L: Length, W: Width 2. Disregard if out of A.A. 
		$W \leq 0.10\text{mm}$ and $L \leq 10\text{mm}$	Disregard	
		$0.10\text{mm} < W \leq 0.30\text{mm}$ and $L \leq 10\text{mm}$	5	
		$W > 0.25\text{mm}$ or $L > 10\text{mm}$	0	
9	Mura (Minor)	By 5% ND filter invisible		

12.6.3.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.

13.ILLUSTRATION OF LCD DATE CODE

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 $23\pm 5^{\circ}\text{C}$ and the humidity is below $50\pm 20\%\text{RH}$.
- (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_0). Adjust V_0 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. so, 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 avoided in case of defect induced by customer.

16. REVISION HISTORY

Version	Revise record	Date
A	New version	2016/05/19
B	Modify PIN Description	2016/05/30
C	Modify Timing characteristics	2016/05/31
D	Modify Items and Criteria	2016/06/02
E	Modify LCM PIN Description	2016/06/14
F	Modify Backlight Characteristic	2016/06/17
G	Modify LCM PIN Description and MECHANICAL DIMENSION	2016/06/22
H	Modify LCM PIN Description	2016/06/24
I	Modify LCM PIN Description and Mechanical dimension	2016/07/05
J	Modify LCM PIN Description	2016/07/06
K	Modify LCM PIN Description and Mechanical dimension	2016/07/20
L	Modify Mechanical dimension	2016/08/23
M	Modify Items and Criteria and Mechanical dimension	2016/09/21
N	Modify Mechanical dimension	2016/09/30
O	Modify Mechanical dimension	2016/10/18