

TFT SPECIFICATION

Part Number	USMP-T123-192072NDV-A0
Size	12.3"
Resolution	1920 x 720
Brightness	700 cd/m ²
Contrast	1000:1
Viewing Angle	85/85/85/85
Operating Temp.	-30 ~ 85°C

FOR ADDITIONAL INFORMATION
PLEASE CONTACT:
engineering@usmicroproducts.com

Issue Date	Approved by (customer use)	Checked by	Prepared by

PROPRIETARY NOTE: THIS SPECIFICATION IS THE PROPERTY OF US MICRO PRODUCTS AND SHALL NOT BE REPRODUCED OR COPIED WITHOUT THE WRITTEN PERMISSION OF US MICRO PRODUCTS AND MUST BE RETURNED TO US MICRO PRODUCTS UPON ITS REQUEST.

(800) 741-7755
www.usmicroproducts.com

TABLE OF CONTENTS

1. GENERAL DESCRIPTION.....	5
2. FEATURES	5
3. MECHANICAL SPECIFICATION	5
4. MECHANICALDIMENS.....	6
5. MAXIMUM RATINGS	7
6. ELECTRICAL CHARACTERISTICS.....	7
7. BACKLIGHT CHARACTERISTIC	8
8. MODULE FUNCTION DESCRIPTION.....	9
8.1. PIN Description	9
8.2. Function Description	11
8.3. AC electrical characteristics	12
8.4. Power on / off Sequence.....	15
9. ELECTRO-OPTICAL CHARACTERISTICS.....	16
10. RELIABILITY	18
10.1MTTF	18
10.2TESTS	18
10.3Color Performance.....	19
11. INSPECTION CRITERIA.....	19
11.1.Inspection Conditions	19
11.2. Light Method.....	19
11.3. Classification Of Defects	20
11.4. Sampling & Acceptable Quality Level.....	20
11.5. Definition Of Inspection Area.....	20
12. ILLUSTRATION OF LCD DATE CODE	21
13. BARCODE RULE.....	22
14. ROHSCOMPLIANT WARRANTY	23
15. PRECAUTIONS FOR USE.....	23
15.1. Safety	23
15.2. Storage Conditions.....	23
15.3. Installing LCD Module	23

15.4. Precautions For Operation 24
15.5. Handling Precautions 24
15.6. Warranty..... 27
16. REVISION HISTORY..... 27

1. GENERAL DESCRIPTION

USMP-T123-192072NDV-A0 is a Transmissive type color active matrix liquid crystal display (LCD), which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, driver IC, FPC and a Backlight unit.

2. FEATURES

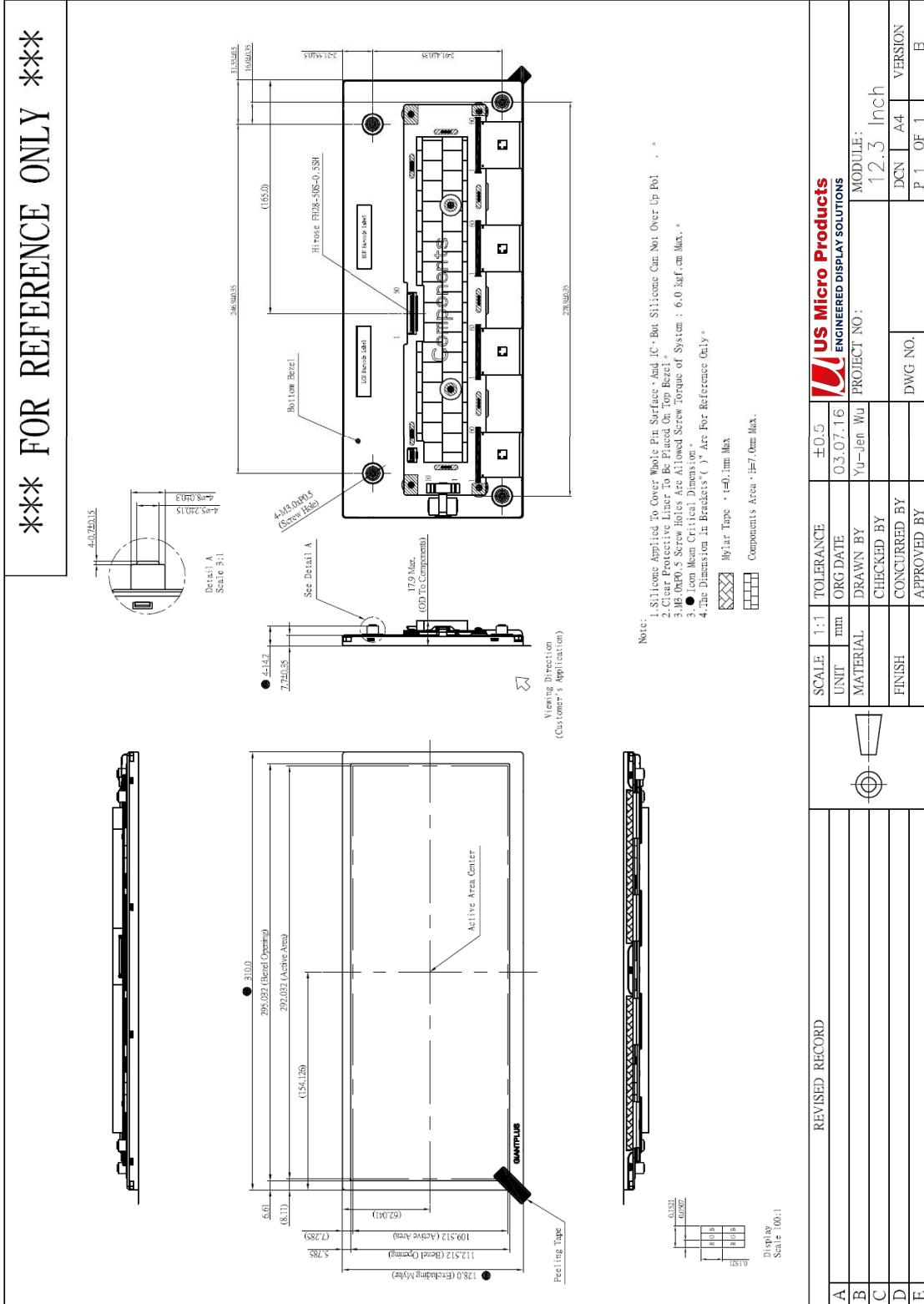
Display Mode	Transmissive Type
	TFT LCD, Negative
Display Format	RGBStrip type
Interface	2 port LVDS
Viewing Direction	Free
Drive IC	Hx8255A*4, Hx8695H*1

3. MECHANICAL SPECIFICATION

Item	Specifications	Unit
Display Size	12.3	Inch
Dimensional outline	310 (W) × 128(H) × 7.7 (D)*	mm
Resolution	1920×3(R,G,B)×720	dot
Active area	292.032 (W) × 109.512 (H)	mm
Pixel pitch	0.152 (W) × 0.152 (H)	mm
Polarizer	AG	

* Exclude FPC

4. MECHANICAL DIMENSIONS



REVISION RECORD		US Micro Products ENGINEERED DISPLAY SOLUTIONS		MODULE:	
A	SCALE	1:1	TOLERANCE	±0.5	PROJECT NO: 12.3 Inch
B	UNIT	mm	ORG DATE	03.07.16	
C	MATERIAL		DRAWN BY	Yu-Jen Wu	
D	FINISH		CHECKED BY		DWG NO. DCN A4 VERSION P 1 OF 1 B
E			CONCURRED BY		
			APPROVED BY		

5. MAXIMUM RATINGS

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

Items	Symbol	Values		Unit	Note
		Min.	Max.		
System Power Voltage	VDD33	-0.3	3.9	V	
Operation temperature	Top	-30	85	°C	
Storage Temperature	Tst	-40	95	°C	
Humidity	-	-	90	%RH	Note 1

Note :

- 1) All the voltages listed above are with respect to GND=0V ◦
- 2) Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above ◦
- 3) Note1: $T_A \leq 40^\circ\text{C}$ Without dewing

6. ELECTRICAL CHARACTERISTICS

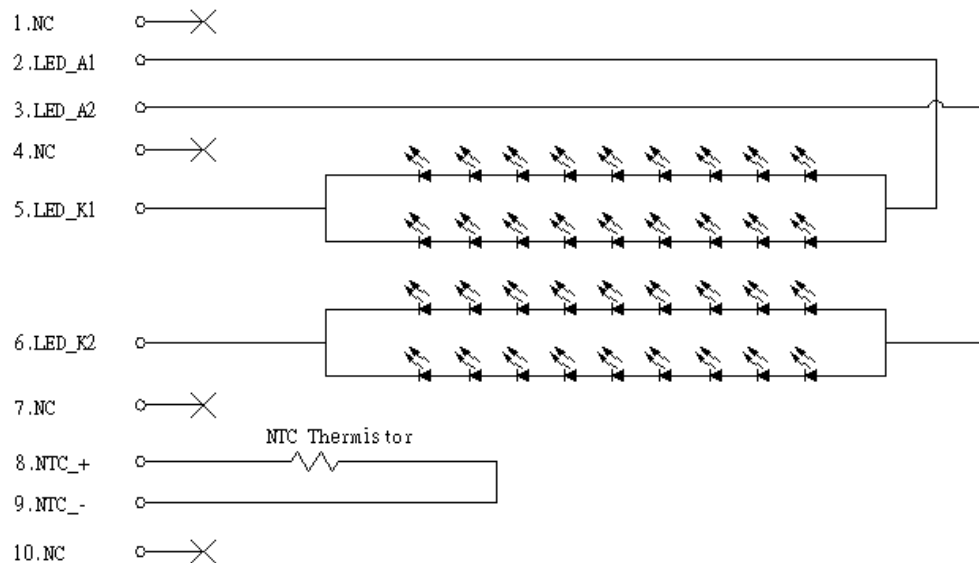
Item	Symbol	Values			Unit	Remark	
		Min.	Typ.	Max.			
Supply Voltage	VDD	3.2	3.3	3.4	V	Note1	
IDD	IDD	-	TBD	TBD	mA	Note1	
Frame Rate	Fr		60		Hz	Note1	
Input Voltage	H level	V_{IH}	$0.7 \cdot VDD$		$VDD+0.3$	V	Note1
	L Level	V_{IL}	$GND-0.3$		$0.3 \cdot VDD$	V	Note1
Output t Voltage	H level	V_{OH}	$VDD-0.4$			V	Note1
	L Level	V_{OL}	GND		$GND+0.4$	V	Note1

Note1: These supply & Input & Output Voltage base on IC data Sheet.

7. BACKLIGHT CHARACTERISTICS

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power Consumption	P_{LED}	-	12.8		W	
LED Current	I_{AK}	-	200	-	mA	
LED Voltage	V_{AK}		3.5		V	$I_{AK}=100\text{mA}/\text{chain}$, 25°C
LED life time (50%,MTTF)	-	-	10000	-	Hr	
Uniformity	-	-	80	-	%	

Backlight LED Circuit :



Note 1: GP suggest using constant current driving this backlight unit.

Note 2: The LED chip luminance decrease to be 50% of original

Note 3: For PWM driving only .

Conditions : Pulse width $T_w \leq 0.1\text{ms}$, Duty ratio $\leq 1/10$

8. MODULE FUNCTION DESCRIPTION

8.1. PIN Description

Pin description

Pin	Symbol	Function
1	GND	Power ground
2	GND	Power ground
3	VDD	System power supply input +3.3V
4	VDD	System power supply input +3.3V
5	VDD	System power supply input +3.3V
6	GND	Power ground
7	NC	No connection
8	WP	Serial Interface chip enable signal for EEPROM.
9	SCLK	Serial Interface clock input for EEPROM.
10	SDAT	Serial Interface address and data input/output.
11	BISTEN	Enable built-in self test (BIST) function. Default pull Low.
12	PWM	Backlight PWM AC signal, H level enable.
13	GND	Power ground
14	OLV0N	Receiver signal of LVDS Odd CH0(-)
15	OLV0P	Receiver signal of LVDS Odd CH0(+)
16	GND	Power ground
17	OLV1N	Receiver signal of LVDS Odd CH1(-)
18	OLV1P	Receiver signal of LVDS Odd CH1(+)
19	GND	Power ground
20	OLV2N	Receiver signal of LVDS Odd CH2(-)
21	OLV2P	Receiver signal of LVDS Odd CH2(+)
22	GND	Power ground
23	OLVCLKN	Receiver signal of LVDS Odd CLK(-)
24	OLVCLKP	Receiver signal of LVDS Odd CLK(+)
25	GND	Power ground
26	OLV3N	Receiver signal of LVDS Odd CH3(-)
27	OLV3P	Receiver signal of LVDS Odd CH3(+)
28	GND	Power ground

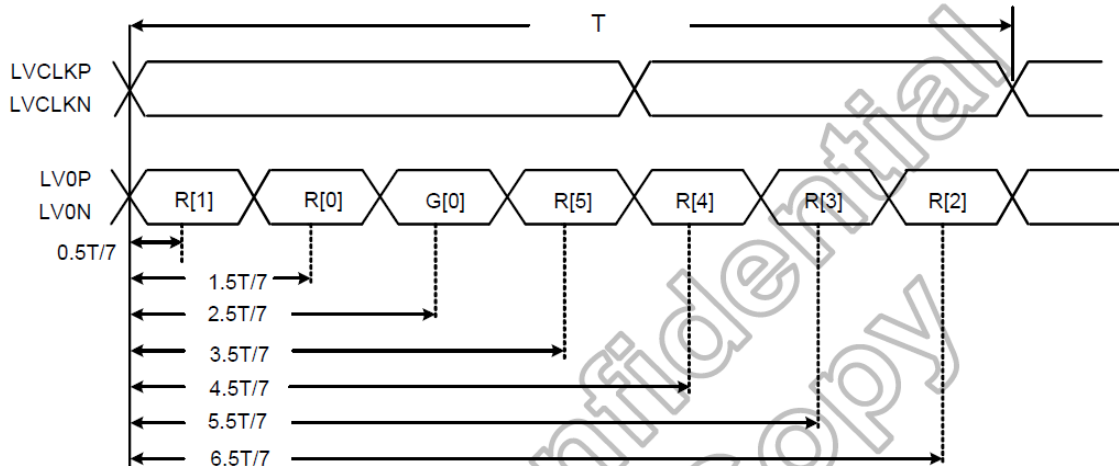
29	ELV0N	Receiver signal of LVDS Even CH0(-)
30	ELV0P	Receiver signal of LVDS Even CH0(+)
31	GND	Power ground
32	ELV1N	Receiver signal of LVDS Even CH1(-)
33	ELV1P	Receiver signal of LVDS Even CH1(+)
34	GND	Power ground
35	ELV2N	Receiver signal of LVDS Even CH2(-)
36	ELV2P	Receiver signal of LVDS Even CH2(+)
37	GND	Power ground
38	ELVCLKN	Receiver signal of LVDS Even CLK(-)
39	ELVCLKP	Receiver signal of LVDS Even CLK(+)
40	GND	Power ground
41	ELV3N	Receiver signal of LVDS Even CH3(-)
42	ELV3P	Receiver signal of LVDS Even CH3(+)
43	GND	Power ground
44	GND	Power ground
45	VDD_LED	Backlight power supply input +12V
46	VDD_LED	Backlight power supply input +12V
47	VDD_LED	Backlight power supply input +12V
48	VDD_LED	Backlight power supply input +12V
49	GND	Power ground
50	GND	Power ground

8.2. Function Description

LVDS receiver

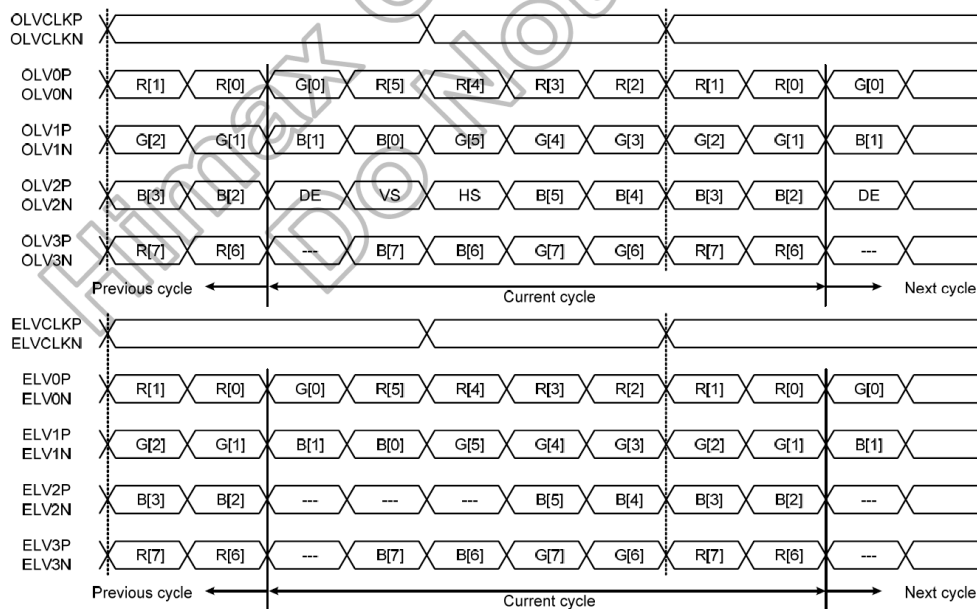
The HX8861-G73-LT has a built-in dual pixel LVDS receiver that converts data from differential serialized format to parallel output.

Ideal strobe position for LVDS input

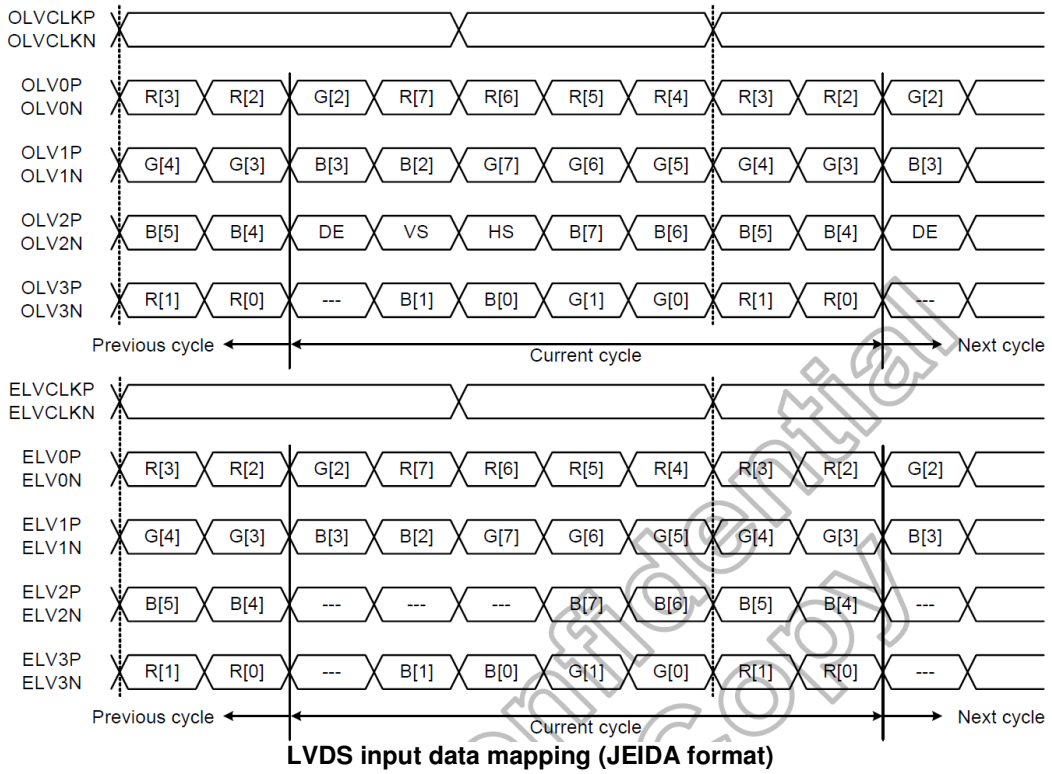


LVDS input data ideal strobe position

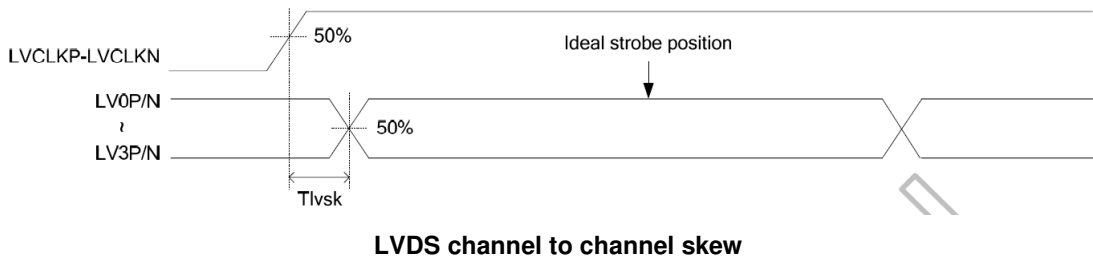
LVDS input data mapping

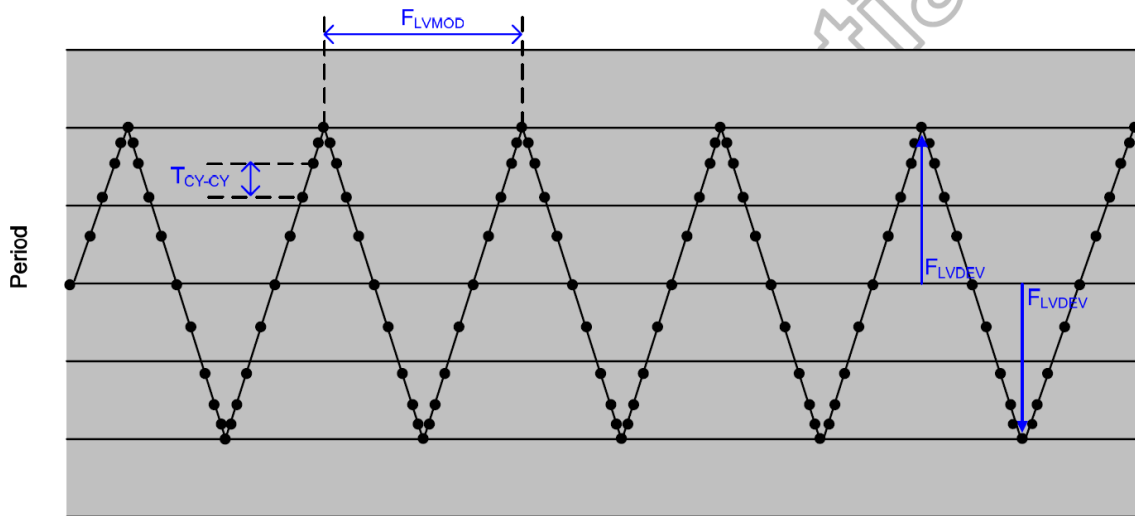


LVDS input data mapping (VESA format)



8.3. AC electrical characteristics



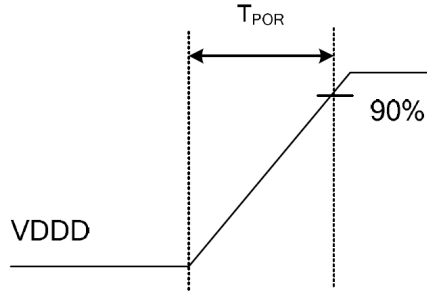


LVDS input SSC

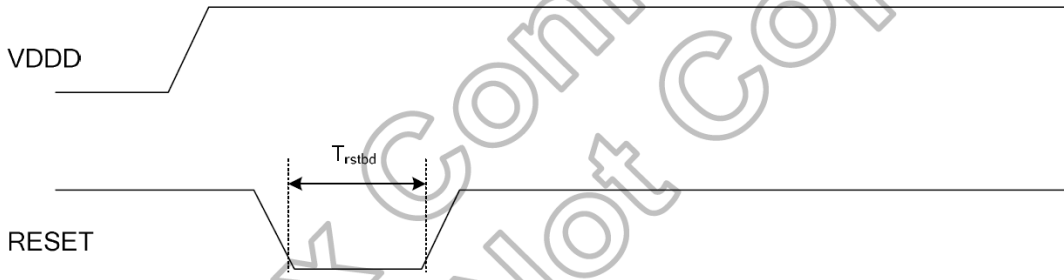
Symbol	Parameter	Condition	Spec.			Unit
			Min.	Typ.	Max.	
F	LVDS Input frequency	-	25	-	110	MHz
TlvsK	LVDS channel to channel skew	F=65MHz $V_{IC}=1.2V$ $V_{ID}=\pm 200mV$	-600	-	+600	ps
F_{LVMOD}	Modulating frequency of input clock during SSC	F=85MHz	10	-	300	KHz
F_{LVDEV}	Maximum deviation of input clock frequency during SSC	$V_{IC}=1.2V$ $V_{ID}=\pm 200mV$	-3	-	+3	%
T_{CY-CY}	Cycle to cycle jitter		-	-	200	ps

Parameter	Symbol	Spec			Unit	Condition
		Min.	Typ.	Max.		
VDDD power source slew time	T_{POR}	-	-	20	ms	From 0V to 90% VDDD
RESET debounce time	T_{rstbd}	0.1	-	-	ms	-

VDDD AC characteristics



VDDD timing



RESET timing

8.4. Power on / off Sequence

This IC is a high-voltage LCD driver, so may be damaged by a large current flow when an incorrect power sequence is used. The recommended sequence should be digital power (VDD&VSSD) logic signals, analog power (VDDA&VSSA) Gamma correction reference voltage (V1~V16). Reverse this sequence to shut down, or turn off all signals and power simultaneously.

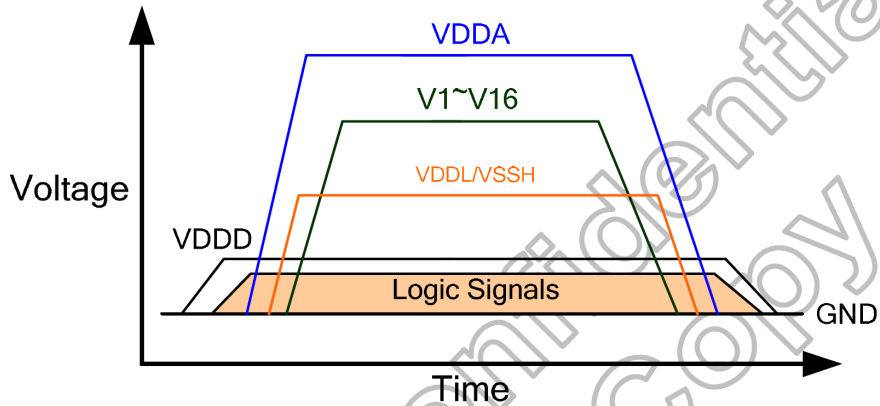


Figure 8.4.1: Power on/off sequence

When power on and before LD is detected, all output channels should output short together, until the first LD is received. This function can avoid the unknown status and random output voltage for all output channels during power on condition.

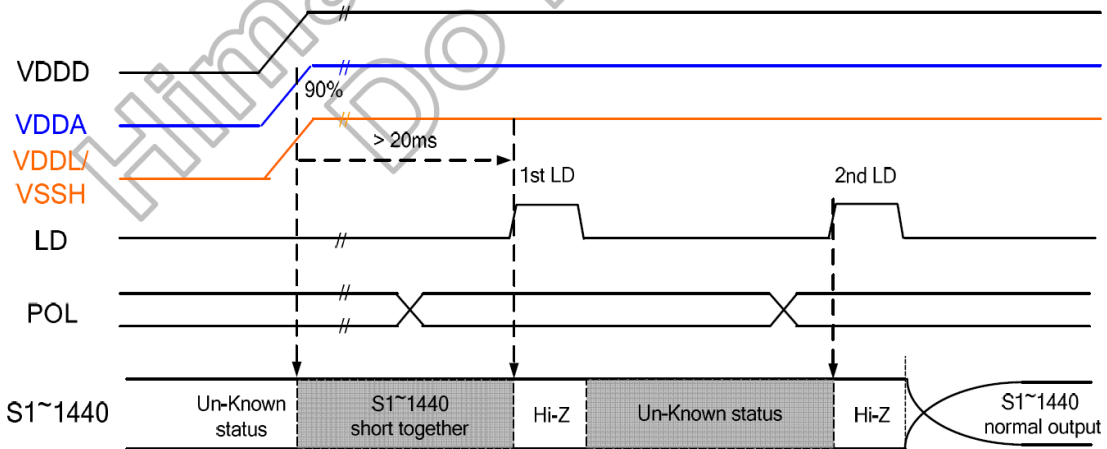


Figure 5.4.2: Power on sequence with LD

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.

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Brightness	-	-	700	-	-	cd/m ²	
Response time	T _R +T _F	Θ=0, -30°C	-	400	-	ms	Note 2
		Θ=0, 25°C	-	25	-		
Contrast ratio	CR	At the center point of A.A.	-	1000	-	-	Note 3
Color Gamut	-	-	-	70	-	%	
Viewing Angle	Φ _H	12	CR ≥ 10	85	-	Degree	Note 5
	θ _R	3		85	-		
	Φ _L	6		85	-		
	θ _L	9		85	-		

T_a=25±2°C

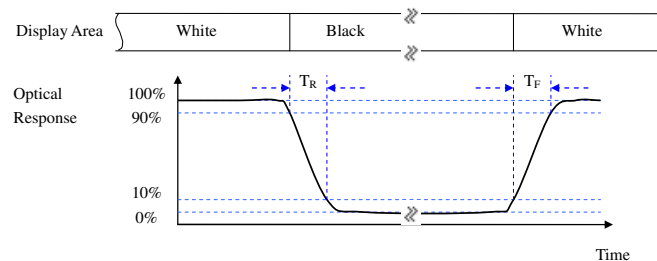
Note:

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 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:

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

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

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

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

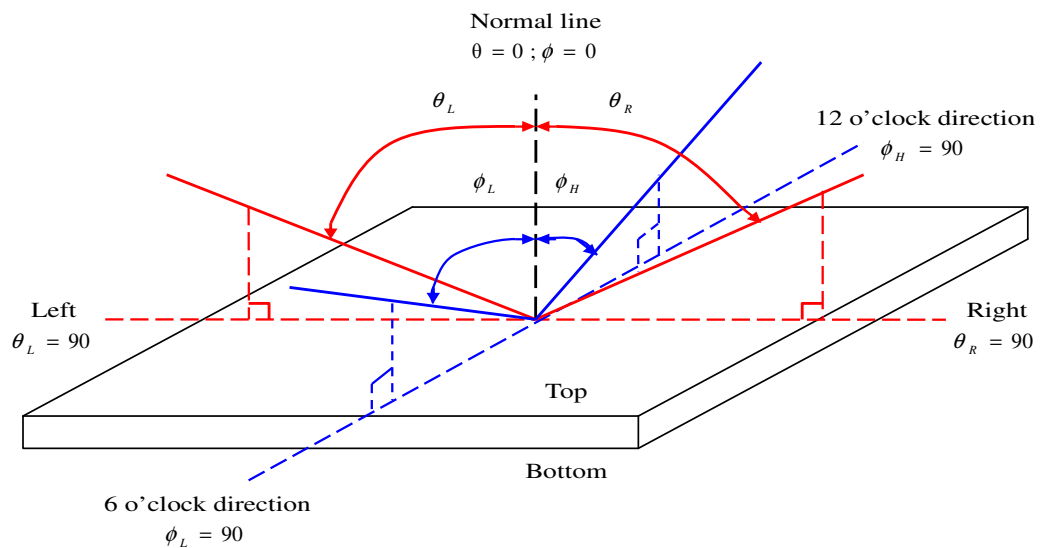
"±" means that the analog input signal swings out of phase with VCOM signal.

Vi50%: 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:



10. RELIABILITY

10.1 MTTF

The LCD module shall be designed to meet a minimum MTTF value of 30,000 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 Non-Operating	95°C , 500 hrs	No Defect Of Operational Function In Room Temperature Are Allowable.
2	Low Temperature Non-Operating	-40°C , 500 hrs	
3	High Temperature Operating	85°C , 500 hrs	
4	Low Temperature Operating	-30°C , 500 hrs	
5	High Temperature/ Humidity Operating	60°C ,90%RH, 500hrs	
6	Temperature Shock Non-Operating	-30°C ↔ 85°C (15min)(5min)(15min) trans : 5min,200cycle	
7	Electro-static Discharge (LCM only)	150pF,330ohm Contact Discharge : ±2KV Air Discharge : ±8KV	
8	Electro-static Discharge (Note 6)	150pF,330ohm Contact Discharge : ±15KV Air Discharge : ±15KV	
9	Vibration tests Non-operating	5 to 9Hz:3.3mm 9 to 200Hz: 1G 200 to 500Hz: 1.5G	

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 resetting, it would be judged as a good part.

Note 6: ESD Test on Car Mirror System.

10.3 Color Performance

No.	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: $50 \pm 20\% \text{RH}$

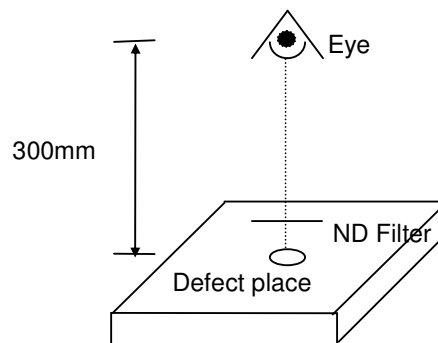
11.1.2. The external visual inspection

With a single $1000 \pm 200 \text{ lux}$ fluorescent lamp as the light source, the inspection was in the distance of 30cm or more from the LCD to the inspector's eyes.

11.2. Light Method

11.2.1. Environment lamp under $1000 \pm 200 \text{ lux}$, Viewing direction for inspection over 300 mm

11.2.2. 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.

Notes: 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

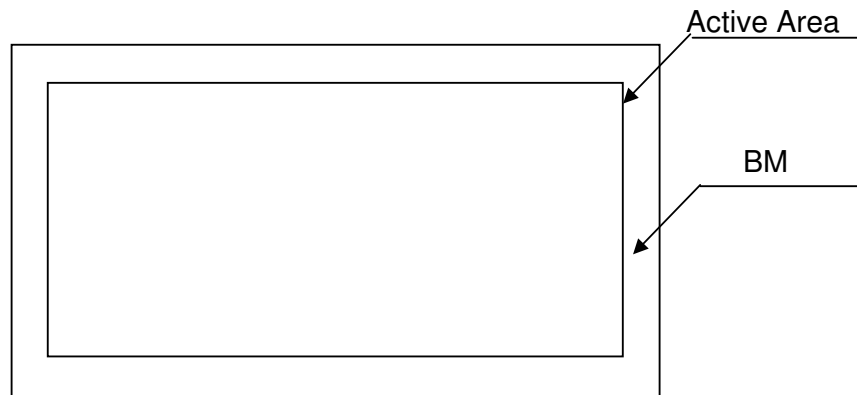
Level II, MIL-STD-105E

Inspection Item	Major defect	Minor defect
Cosmetic	1.0%	1.5%
Electrical test	0.4%	0.65%

11.5. Definition Of Inspection Area

V.A: Viewing Area

i. A: Active Area



12. ILLUSTRATION OF LCD DATE CODE

13. Barcode Rule

TBD

14. RoHS COMPLIANT WARRANTY

RoHS Hazardous substances including:

- Pb : Solder<500 ppm, Other<300ppm
- Hg<200ppm
- Cr6+<200ppm
- Cd<50ppm
- PBB<200ppm
- PBDE<200ppm
- Deca-BDE<200ppm
- HBCD<200ppm
- Asbestos<1000ppm

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 ± 0.1 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.

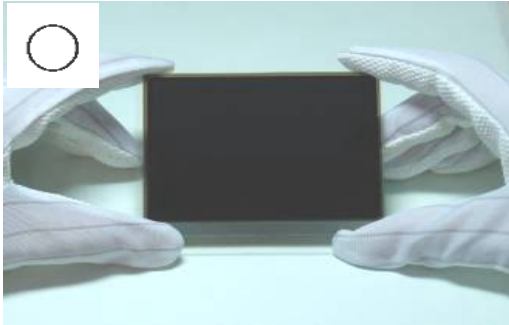
15.5. Handling Precautions

- (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. 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.

i. Handling precaution for LCD

LCD is easy to be damaged.
Please note below and be careful for handling!

Correct handling:



As above photo, please handle with anti-static gloves around LCD edges.

Incorrect handling:



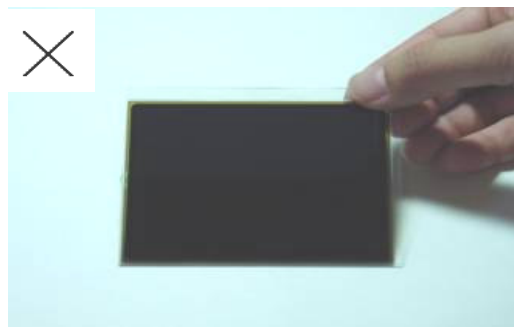
Please don't stack the LCDS.



Please don't hold the surface of LCD.



Please don't operate with sharp stick such as pens.



Please don't touch ITO glass without anti-static gloves.

ii. Handling precaution for LCM

LCM is easy to be damaged.
Please note below and be careful for handling!

Correct handling:

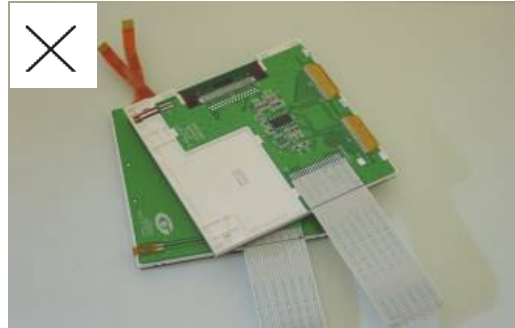


As above picture, please handle with anti-static gloves around LCM edges.

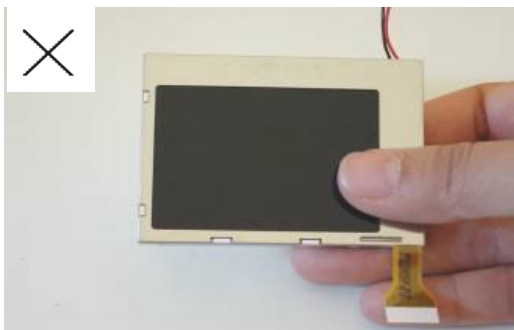
Incorrect handling:



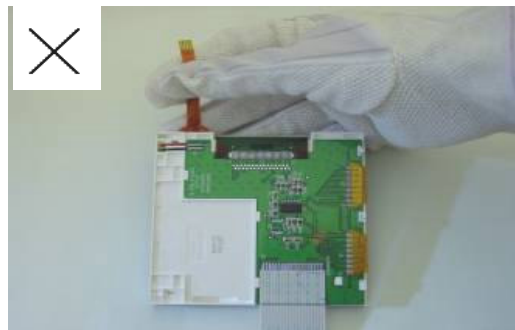
Please don't touch IC directly.



Please don't stack LCM.



Please don't hold the surface of panel.



Please don't stretch interface of output, such as FPC cable.

15.6.Warranty

- i. The period is within 12 months since the date of shipping out under normal using and storage conditions.
- ii. The warranty will be avoided in case of defect induced by customer.

16. REVISION HISTORY

Version	Revise record	Date
A	New version	2016/5/12
B	修訂視角錯誤	2016/7/19