ALL SHORE INDUSTRIES

ASI-T-1500IA3LN/W

No	Item	Specification	Remark
1	Type	Transmissive	--
2	Display Mode	Normally Black	--
3	Pixel Element	a-Si TFT	--
4	Screen Size	15.0inch	--
5	Interface	LVDS	--
6	Resolution	1024(RGB) x 768	--
7	Active Area	304.128 (W) x 228.096(L) (mm)	--
8	Pixel Size	0.297 x 0.297 (mm)	--
9	Color Arrangement	RGB-stripe	--
10	Assembly Type	COG	--
11	Back Light	White LED	--
12	Viewing Direction	Free	--
13	Weight	(930)	g
14	Module Dimension	326.5(W) x253.5 (L) x9.7(H) (mm)	

ALL SHORE INDUSTRIES

RECORD OF REVISION

DATE	REV.	PAGE	SUMMARY

3. General specifications

3.1 General specifications

It is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses the amorphous silicon TFT as a switching devices. This model is composed of a Transmissive type TFT-LCD Panel, a driver circuit and a back-light unit.

3.2 Features

- High image quality a-Si TFT LCD module.
- 16.7M color number.
- High contrast, high brightness
- Low power consumption.

4. Mechanical data

No	Item	Specification	Remark
1	Type	Transmissive	--
2	Display Mode	Normally Black	--
3	Pixel Element	a-Si TFT	--
4	Screen Size	15.0inch	--
5	Interface	LVDS	--
6	Resolution	1024(RGB) x 768	--
7	Active Area	304.128 (W) x 228.096(L) (mm)	--
8	Pixel Size	0.297 x 0.297 (mm)	--
9	Color Arrangement	RGB-stripe	--
10	Assembly Type	COG	--
11	Back Light	White LED	--
12	Viewing Direction	Free	--
13	Weight	(930)	g
14	Module Dimension	326.5(W) x253.5 (L) x9.7(H) (mm)	

5. Absolute maximum ratings

5.1 Electrical absolute maximum ratings

(1) TFT-LCD Panel Absolute Maximum Ratings

Ta=25℃

Item	Symbol	Condition	Standard Value		Unit	Remark
			Min.	Max.		
Power supply	VDD	GND=0V	-0.3	4.0	V	

* If the LSI is used above these absolute maximum ratings, it may become permanently damaged. Using the LSI within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are also exceeded, the LSI will malfunction and cause poor reliability.

(2) Back-Light Unit

Ta=25℃

Item	Symbol	Condition	Standard		Unit	Remark
			Min.	Max.		
Power supply voltage for LED Driver	LED_VCC	LED_GND=0V	--	26.4	V	-

5.2 Environmental absolute maximum ratings

Item	Symbol	Min.	Max.	Unit	Remark
Operation temperature range	Top	-20	70	℃	Ambient
Storage temperature range	Tst	-20	70	℃	Ambient

(1) Corrosive gas environment is not acceptable.
(2) TFT-LCD color will change slightly depending on environment temperature. This phenomenon is reversible.

6. Electrical characteristics

6.1 TFT-LCD Module

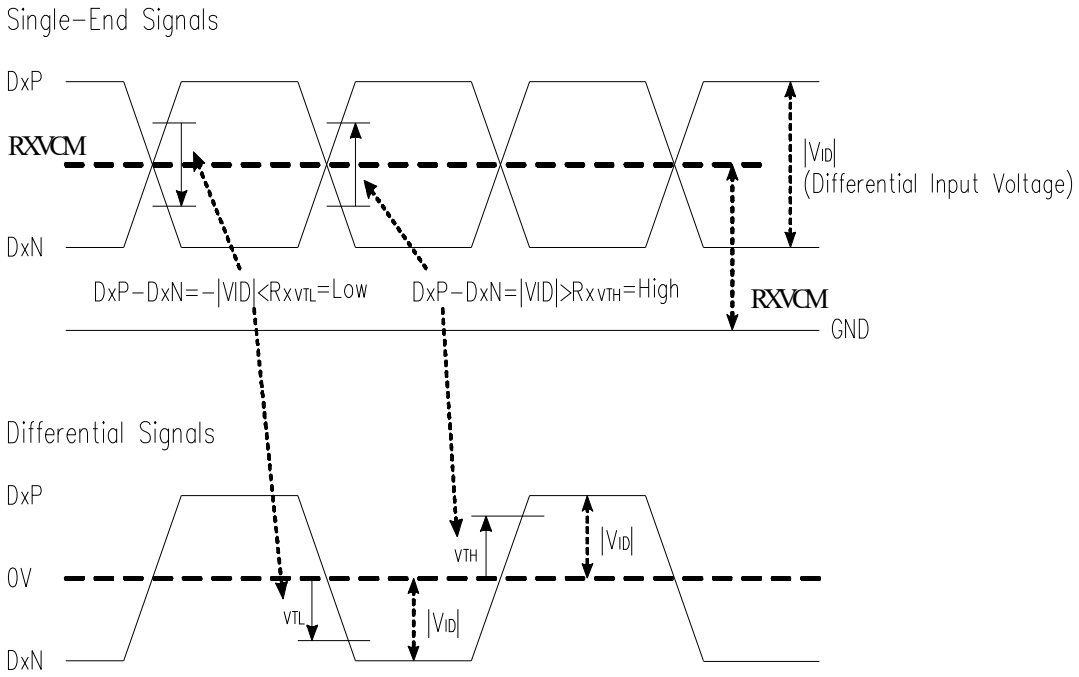
Ta =25℃

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply	VDD	3.0	3.3	3.6	V	-
Power Supply Current	IDD	-	410	740	mA	-
Hight level input voltage	VIH	-	-	VDD	V	-
Low level input voltage	VIL	0.7VDD		0.3VDD	V	-

6.2 LVDS Receiver

Ta =25℃

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
High-level differential input voltage threshold	VTH	-	-	+0.1	V	VLVC =1.2V
Low-level differential input voltage threshold	VTL	-0.1	-	-	V	
Single-ended input voltage range	VLVC	0.7	-	1.6	V	
Input voltage common mode range	RXVCM	1.0	1.2	1.8-|VID|/2	V	
Differential input voltage	|VID|	0.2	-	0.6	V	



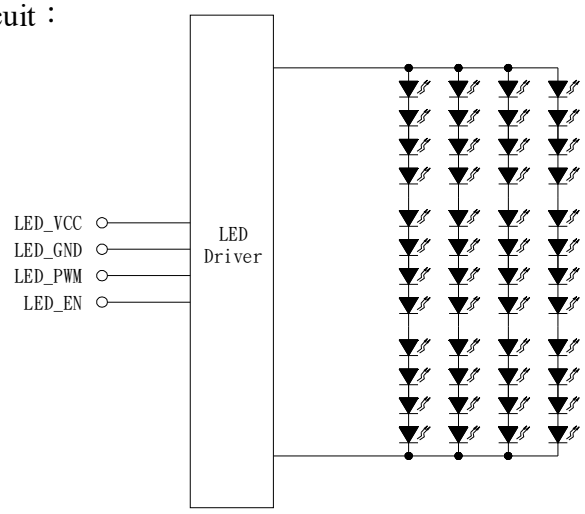
6.3 Back-Light Unit

Ta =25℃

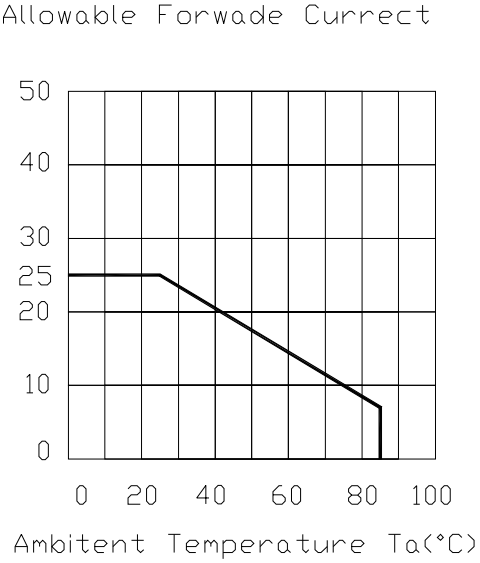
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply voltage for LED Driver	LED_VCC	10.8	12.0	12.6	V	LED_GND=0V
	ILED_VCC	-	(600)	(700)	mA	LED_VCC=12.0V
EN Voltage	BL ON	3.0	3.3	3.6	V	-
	BL OFF	0	0	0.6	V	
PWM Voltage	High Level	3.0	3.3	3.6	V	-
	Low Level	0	0	0.6	V	
Input PWM Frequency	fPWM	0.12	-	20	KHz	Duty= 5%~100%
Life Time	Lf	-	50,000	-	hrs	NOTE(1)

NOTE(1): The “LED life time” is defined as the module brightness decreases to 50% of original brightness that the ambient temperature is 25℃.

NOTE(2): Back-light circuit：



NOTE(3): Current reduction rate of LED backlight is according to the graph indicated below：

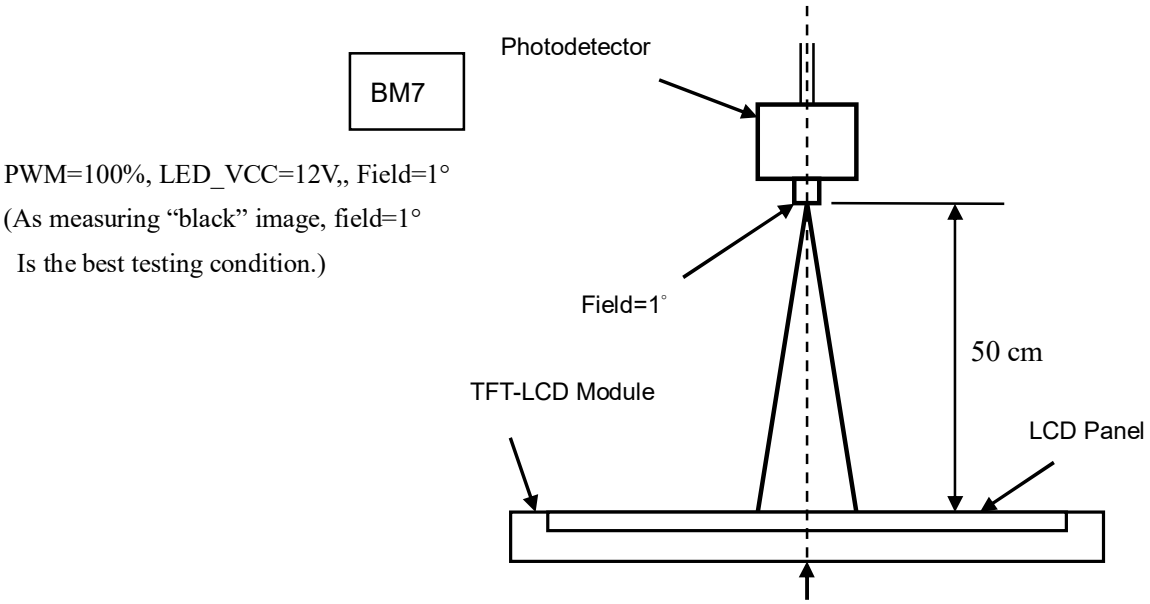


7. Optical characteristics

Ta=25℃, LED_PWM=100%, LED_VCC=12V

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness		B	θ=0° Normal viewing angle At the center of panel	300	350	--	cd/m^2	(1)
Contrast Ratio		C/R		700	1000	--	--	(2)
Response Time		Tr + Tf		--	30	35	ms	(3)
Color chromaticity	White	Wx		--	(0.313)	--	--	--
		Wy		--	(0.329)	--		
	Red	Rx		--	(0.649)	--	--	--
		Ry		--	(0.338)	--		
	Green	Gx		--	(0.323)	--	--	--
		Gy		--	(0.627)	--		
	Blue	Bx		--	(0.155)	--	--	--
		By		--	(0.056)	--		
Viewing Angle	Top	θ_U	C/R≧10 Backlight On	85	89	--	Deg.	(4)
	Bottom	θ_D		85	89	--		
	Left	θ_L		85	89	--		
	Right	θ_R		85	89	--		
Uniformity		Un	θ=0° Normal viewing angle	75	--	--	%	(5)

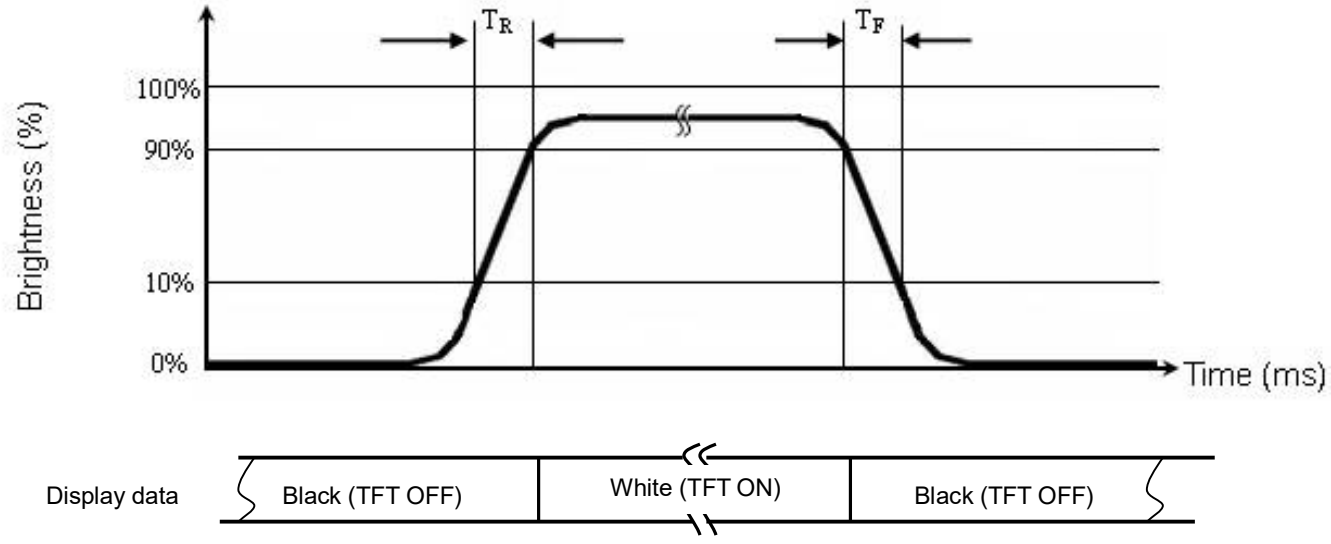
Note (1): The brightness test equipment setup



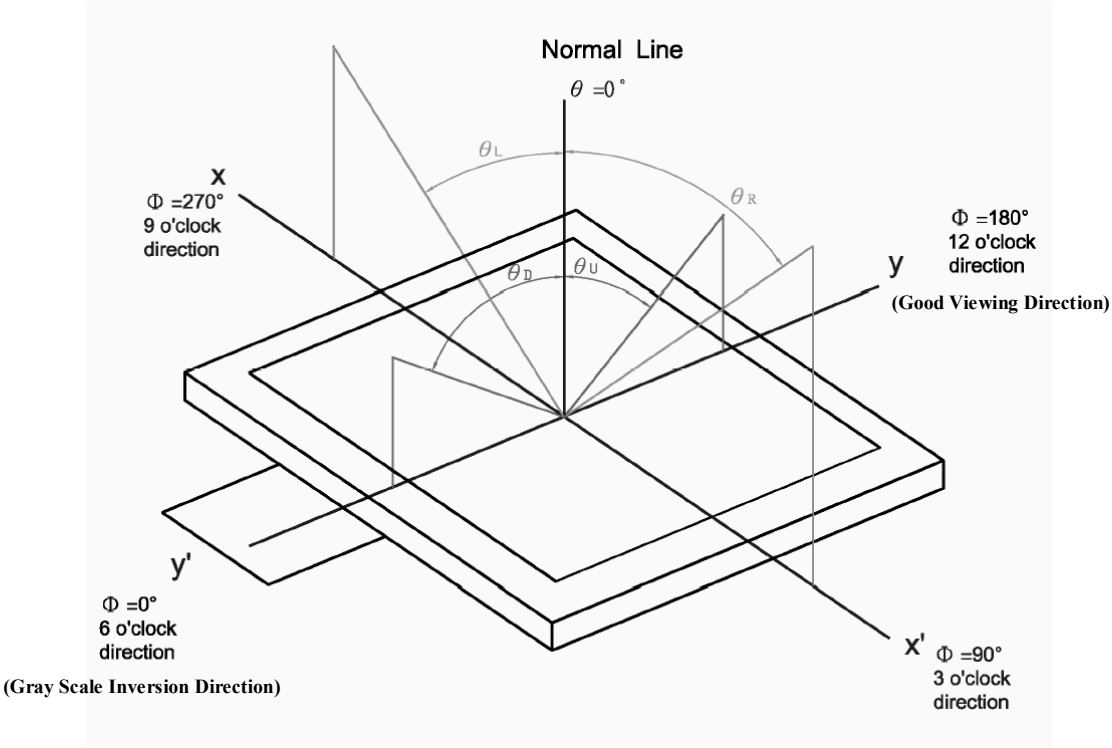
Note 2: Definition of contrast Ratio (C/R)

$$C/R = \frac{\textbf{Brightness When LCD is at "White" State}}{\textbf{Brightness When LCD is at "Black" State}}$$

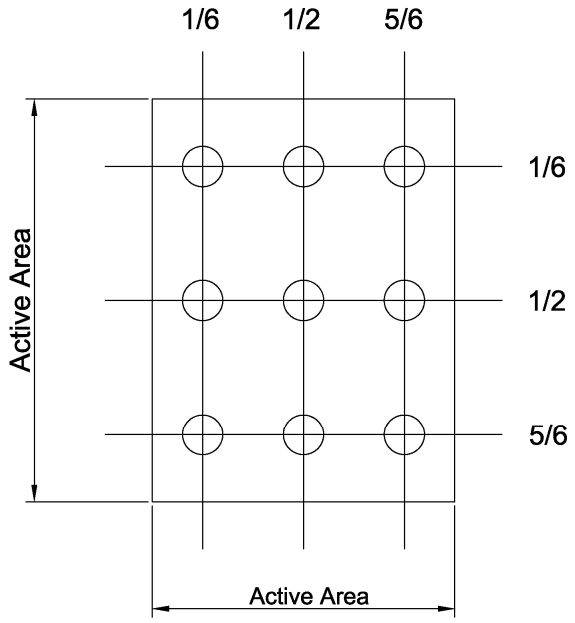
Note 3: Definition of response time



Note 4: Definition of viewing angle



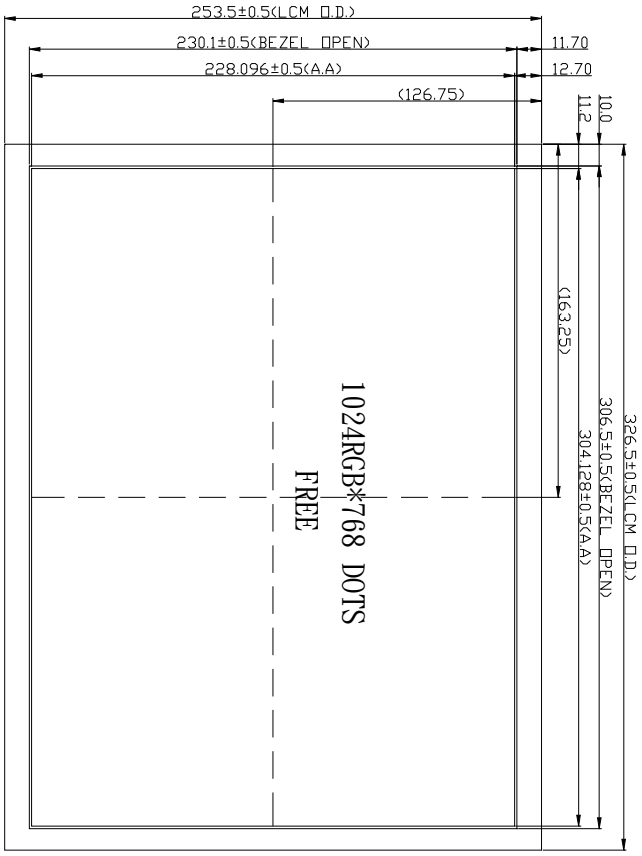
Note 5: Definition of uniformity (Un)

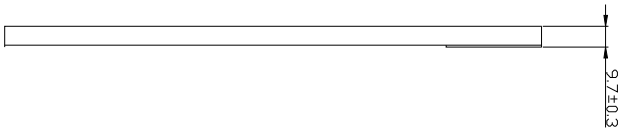


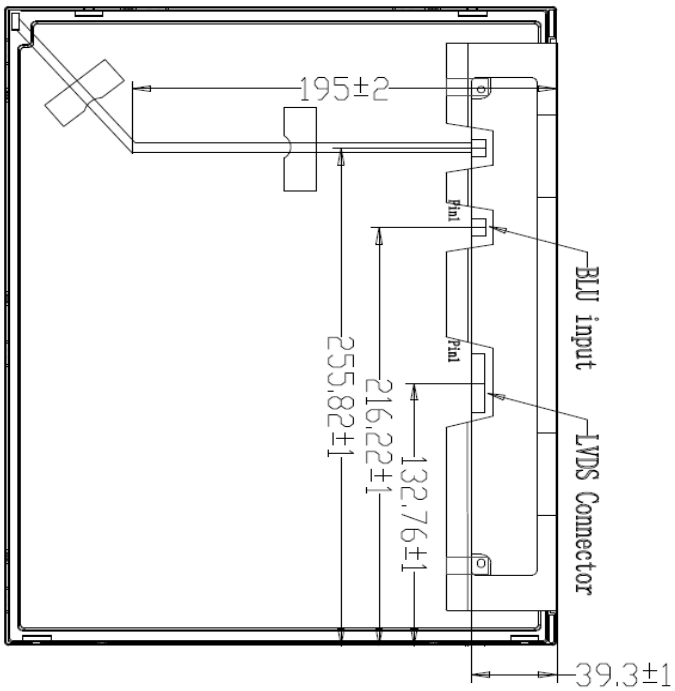
$$Un = \frac{Bmin}{Bmax} x100\%$$

8. Outline dimension

NOTE:
1. UNIT:mm
2. SCALE:NTS
3. LED Connector:CI4205M1HR0-NH or Equivalent
4. LVDS Connector:MSB240420HEA or Equivalent

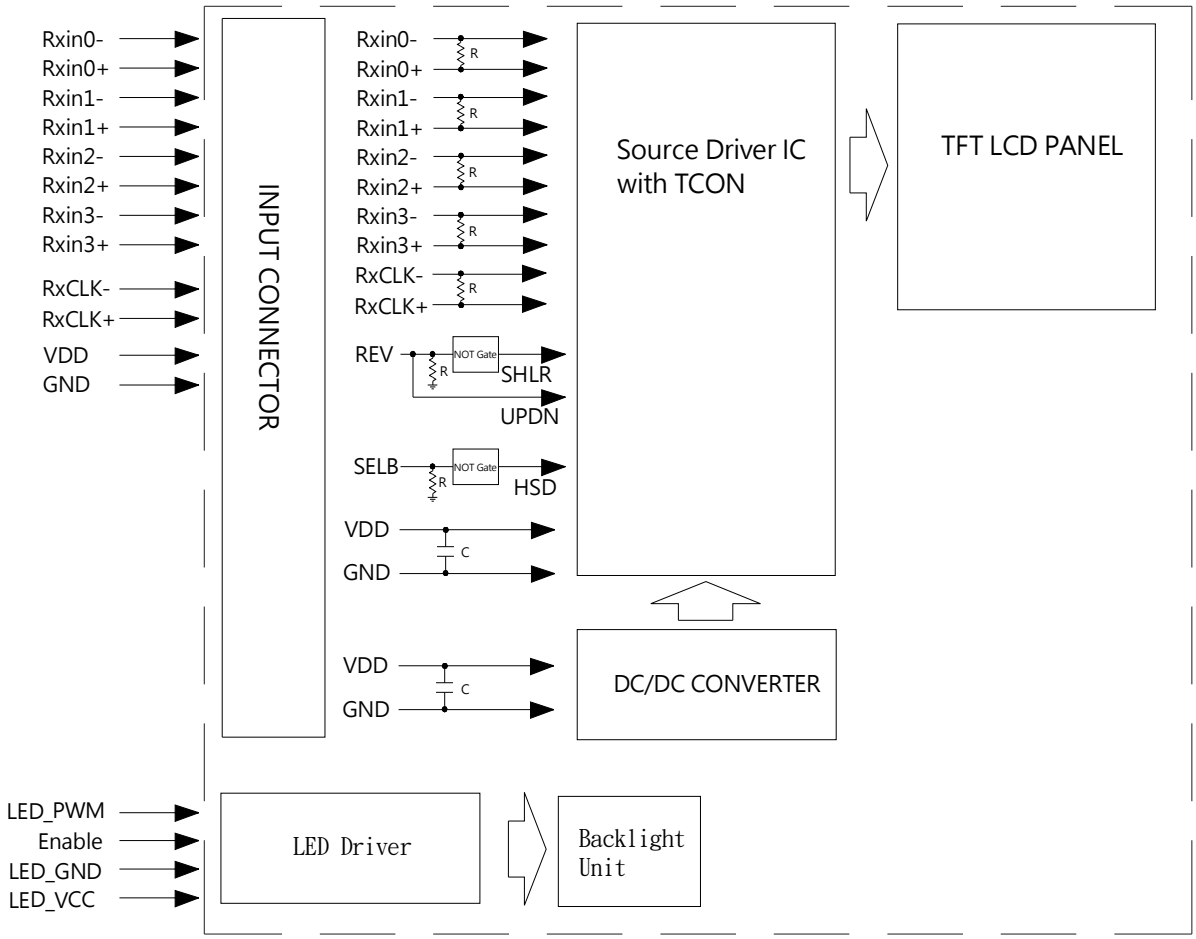






9.Block diagram

9.1 TFT-LCD Module (Interface System Structure)



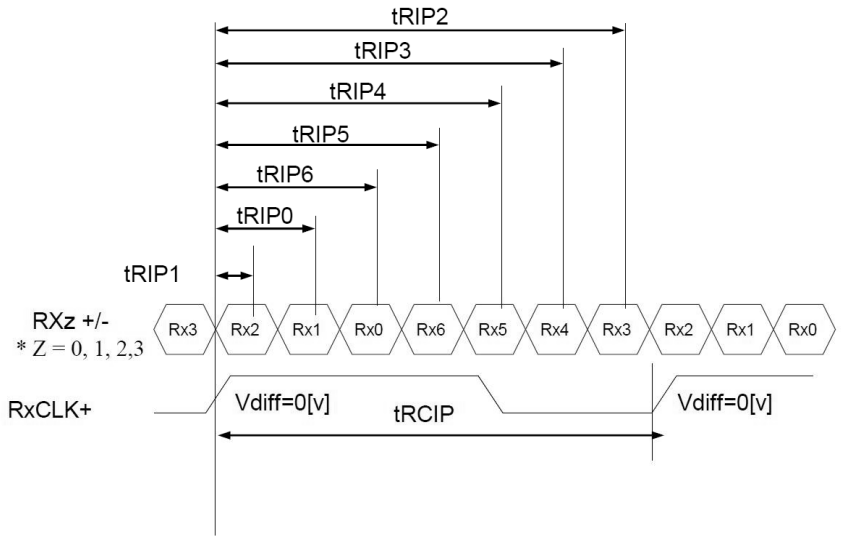
10. Input Terminal Pin Assignment

10.1 Input Signal Connector : MSB240420HEA or Compatible

Pin no	Symbol	Description	Remark
1~2	VDD	Power Supply (3.3V)	-
3	GND	Ground.	-
4	NC	No connection	-
5	RxIN0-	LVDS CH0 Data (-)	
6	RxIN0+	LVDS CH0 Data (+)	-
7	GND	Ground.	-
8	RxIN1-	LVDS CH1 Data (-)	-
9	RxIN1+	LVDS CH1 Data (+)	-
10	GND	Ground.	-
11	RxIN2-	LVDS CH2 Data (-)	-
12	RxIN2+	LVDS CH2 Data (+)	-
13	GND	Ground.	-
14	RxCLK-	LVDS CLK Data (-)	
15	RxCLK+	LVDS CLK Data (+)	
16	GND	Ground.	
17	RxIN3-	LVDS CH3 Data (-)	
18	RxIN3+	LVDS CH3 Data (+)	
19	GND	Ground.	
20	NC	No connection	

10.2 Bits LVDS input(Table LVDS Rx Interface Timing Specification)

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	10.31	13.47	15.87	nsec	
Input Data 0	tRIP1	0.5 ×tRCIP/7-0.4	0.5 ×tRCIP/7	0.5 ×tRCIP/7 +0.4	nsec	
Input Data 1	tRIP0	1.5 ×tRCIP/7 -0.4	1.5 ×tRCIP/7	1.5 ×tRCIP/7 +0.4	nsec	
Input Data 2	tRIP6	2.5 ×tRCIP/7-0.4	2.5 ×tRCIP/7	2.5 ×tRCIP/7+0.4	nsec	
Input Data 3	tRIP5	3.5 ×tRCIP/7-0.4	3.5 ×tRCIP/7	3.5 ×tRCIP/7+0.4	nsec	
Input Data 4	tRIP4	4.5 ×tRCIP/7-0.4	4.5 ×tRCIP/7	4.5 ×tRCIP/7+0.4	nsec	
Input Data 5	tRIP3	5.5 ×tRCIP/7-0.4	5.5 ×tRCIP/7	5.5 ×tRCIP/7+0.4	nsec	
Input Data 6	tRIP2	6.5 ×tRCIP/7-0.4	6.5 ×tRCIP/7	6.5 ×tRCIP/7+0.4	nsec	



* Vdiff = (RXz+)-(RXz-),…. ,(RXCLK+)-(RXCLK-)

10.3 LED connector：CI4205M1HR0-NH or Compatible

Pin no	Symbol	Description	Remark
1	NC	No connection	-
2	LED_PWM	PWM Dimming	-
3	Enable	3.3V(ON) / OV(OFF)	-
4	LED_GND	Ground.	
5	LED_VCC	12V	-

11. Timing characteristics

11.1 AC Electrical characteristics

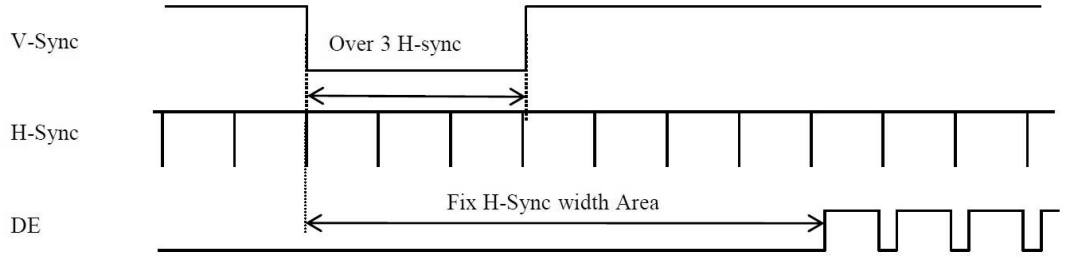
Timing Parameters (DE only mode)

Item		Symbols		Min	Typ	Max	Unit
Clock	Frequency	1/Tc		52	58	71	MHz
	High Time	Tch		-	4/7Tc	-	
	Low Time	Tcl		-	3/7Tc	-	
Frame Period		Tv		48	60	63	Hz
Horizontal Active Display Term		Valid	t_{HV}	-	1024	-	t_{CLK}
		Total	t_{HP}	1200	1344	1400	t_{CLK}
Vertical Active Display Term		Valid	t_{VV}	-	768	-	t_{HP}
		Total	t_{VP}	788	806	845	t_{HP}

11.2 LVDS Input SSCG

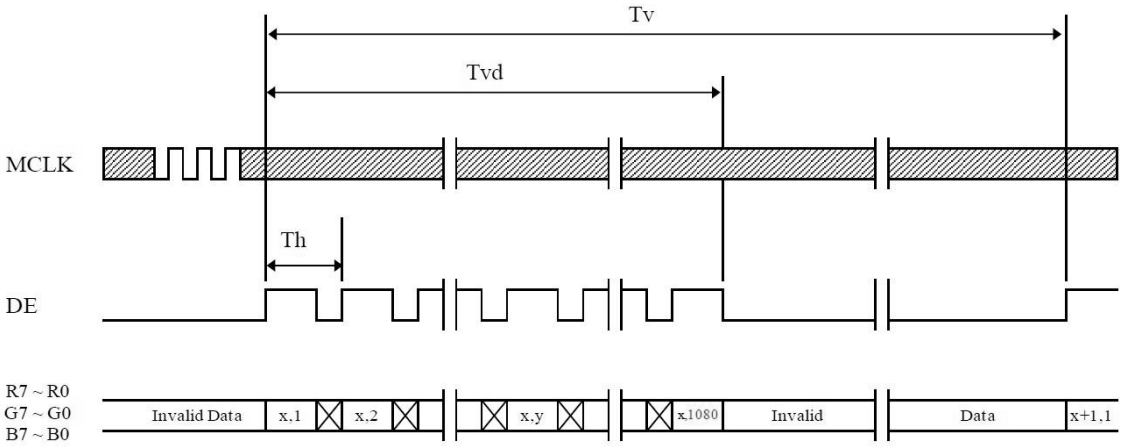
Symbol	Parameter	Condition	Min	Typ	Max	Unit
F	LVDS Input frequency	-	25	-	100	MHz
T_{LVSK}	LVDS channel to channel skew	F=58MHz V_{IC}=1.2V V_{ID}=±200mV	-600	-	+600	ps
F_{LVMOD}	Modulating frequency of input clock during SSC	F=58MHz V_{IC}=1.2V V_{ID}=±200mV	10	-	300	KHz
F_{LVDEV}	Maximum deviation of input clock frequency during SSC		-3	-	+3	%
T_{CY-CY}	Cycle to Cycle jitter		-	-	200	ps

11.3 Sync Timing Waveform

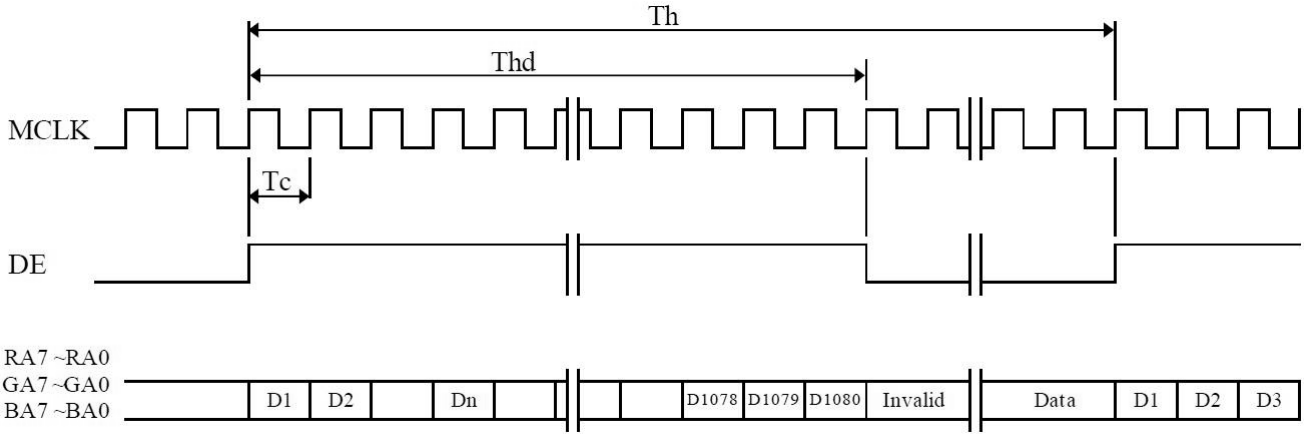


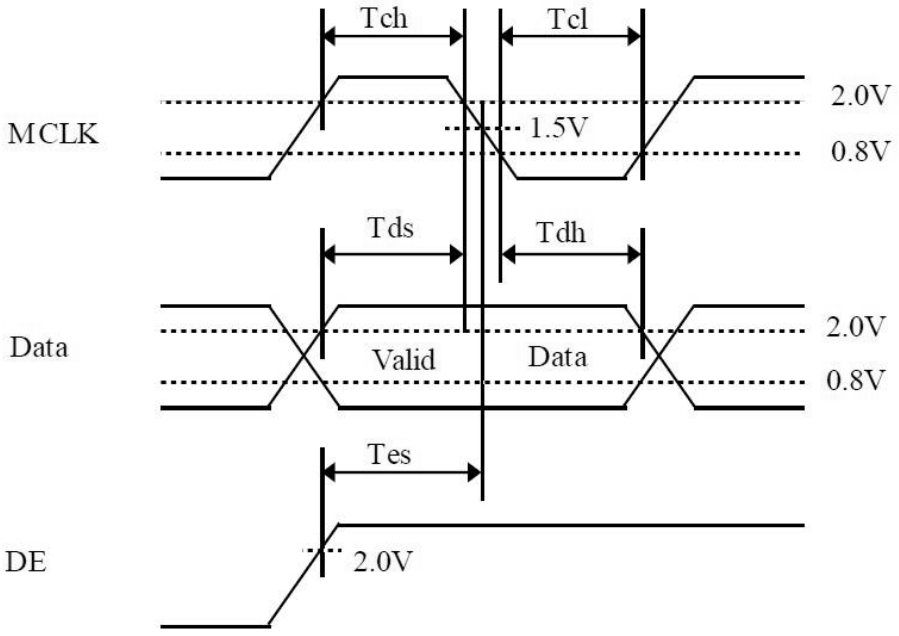
1) Need over 3 H-sync during V-Sync Low
2) Fix H-Sync width from V-Sync falling edge to first rising edge

11.4 Vertical Timing Waveform



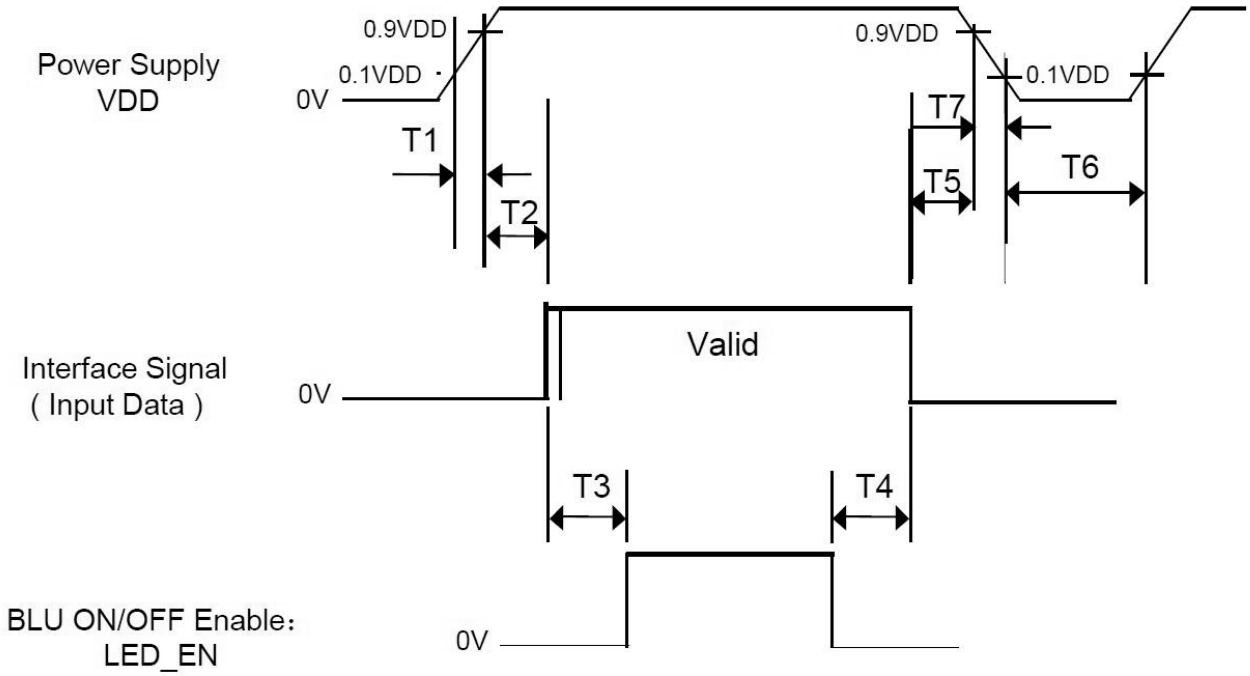
11.5 Horizontal Timing Waveform()





11.6 Power on/off Sequence

To prevent a latch-up or DC operation of the LCD module
The Power on / off shall be as shown in below:



Sequence Table

Parameter	Values			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	500	-	-	ms
T4	500	-	-	ms
T5	0	-	30	ms
T6	1	-	-	s

Notes:

1. Back Light must be turn on after power for logic and interface signal are valid.
2. Even though T1 is out of SPEC, it is still ok if the inrush current of VDD is below the limit.
3. When VDD<0.9VDD(Typ.),Power off.
4. T7 decreases smoothly, if there were rebounding voltage, it must smaller than 0.5 volts.

12. Reliability Test Items

No.	Test items	Conditions	Remark
1	High temperature operation	70°C , 240hours	-
2	Low temperature operation	-20°C , 240hours	-
3	High temperature storage	70°C , 240hours	-
4	Low temperature storage	-20°C , 240hours	-
5	High temperature & high humidity storage	40°C , 90% RH , 240hours	-
6	Thermal Shock storage	-20°C , 30min. ~ 60°C , 30min. , 100 Cycles	-
7	Vibration test	Sweep frequency :10~55~10 Hz, Amplitude : 0.75mm Test direction : X, Y, Z 3 axis, and duration Test time : 0.5hr for each axis	Non-operation
Criterion: There should be no change which might affect the practical display function when the display quality test is conducted under normal operating condition.			

13. General Precautions

Please pay attentions to the followings as using the LCD module.

13.1 Handling

(a) Do not apply strong mechanical stress like drop, shock or any force to LCD module. It may cause improper operation, even damage.

(b) Because the polarizer is very fragile and easy to be damaged, do not hit, press or rub the display surface with hard materials.

(c) Do not put heavy or hard material on the display surface, and do not stack LCD modules.

(d) If the display surface is dirty, please wipe the surface softly with cotton swab or clean cloth.

(e) Avoid using Ketone type materials (e.g. Acetone), Toluene, Ethyl acid or Methyl chloride to clean the display surface. It might damage the polarizer permanently. The recommended solvents are water and Isopropyl alcohol.

(f) Wipe off water droplets or oil immediately.

(g) Protect the LCD module from ESD. It will damage the LSI and the electronic circuit.

(h) Do not touch the output pins directly with bare hands.

(i) Do not disassemble the LCD module.

13.2 Storage

(a) Do not leave the LCD modules in high temperature, especially in high humidity for a long time.

(b) Do not expose the LCD modules to sunlight directly.

(c) The liquid crystal is deteriorated by ultraviolet. Do not leave it in strong ultraviolet ray for a long time.

(d) Avoid condensation of water. It may cause improper operation.

(e) Please stack only up to the number stated on carton box for storage and transportation. Excessive weight will cause deformation and damage of carton box.

13.3 Operation

(a) When mounting or dismounting the LCD modules, turn the power off.

(b) Protect the LCD modules from electric shock.

(c) The Driver IC control algorithms should always obeyed to avoid damaging the LSI and electronic circuit.

(d) Be careful to avoid mixing up the polarity of power supply for backlight.

(e) Absolute maximum rating specified above has to be always kept in any case. Exceeding it may cause non-recoverable damage of electronic components or, nevertheless, burning.

(f) When a static image is displayed for a long time, remnant image is likely to occur.

(g) Be sure to avoid bending the FPC to an acute shape, it might break FPC.

13.4 Others

(a) If the liquid crystal leaks from the panel, it should be kept away from the eyes or mouth.

(b) For the fragility of polarizer, it is recommended to attach a transparent protective plate over the display surface.

(c) It is recommended to peel off the protection film on the polarizer slowly so that the electrostatic charge can be minimized.

14. Quality and reliability

14.1 Test condition

Test should be conducted under the following conditions:

(a) Ambient temperature: 25 ± 5°C

(b) Humidity: 55 ± 10% RH

14.2 Sampling plan

Sampling method shall be in accordance with MIL-STD-105D, inspection level II, normal inspection, and single sampling plan tables for normal tightened and reduced inspection.

14.3 Acceptable quality level

A major defect is a defect that could result in failure or materially reduce that the usability of the unit of product for its intended purpose.

A minor defect is one that does not materially reduce the usability of the unit of product for its intended purpose or is a departure from established standards having no significant bearing on the effective use or operation of the unit.

14.4 Appearance

Appearance test is to be conducted by human eyes at approximately 30cm distance from LCD module under the single fluorescent light without reflection.

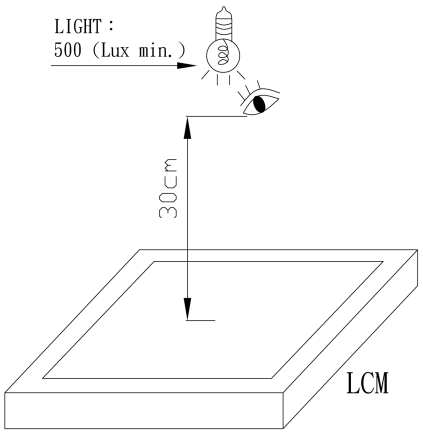
Condition:

(a) Illumination: 500 Lux min

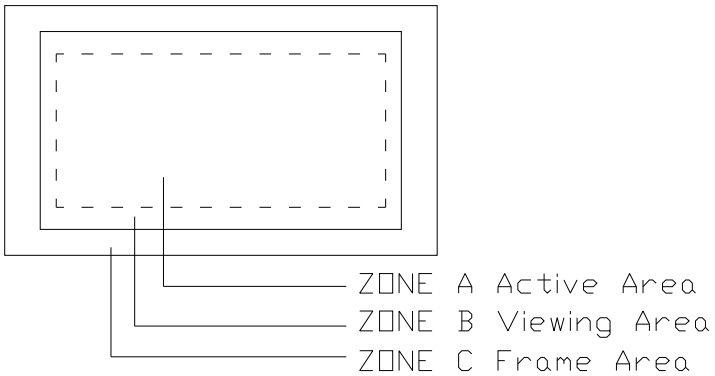
(b) Inspect determination: 30cm

(c) Inspect direction: above the LCM

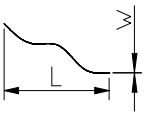
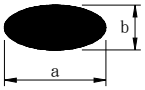
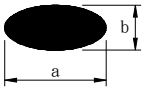
(d) View angle: ±30°



The inspection area of LCD panel shall be within the range of following limits.

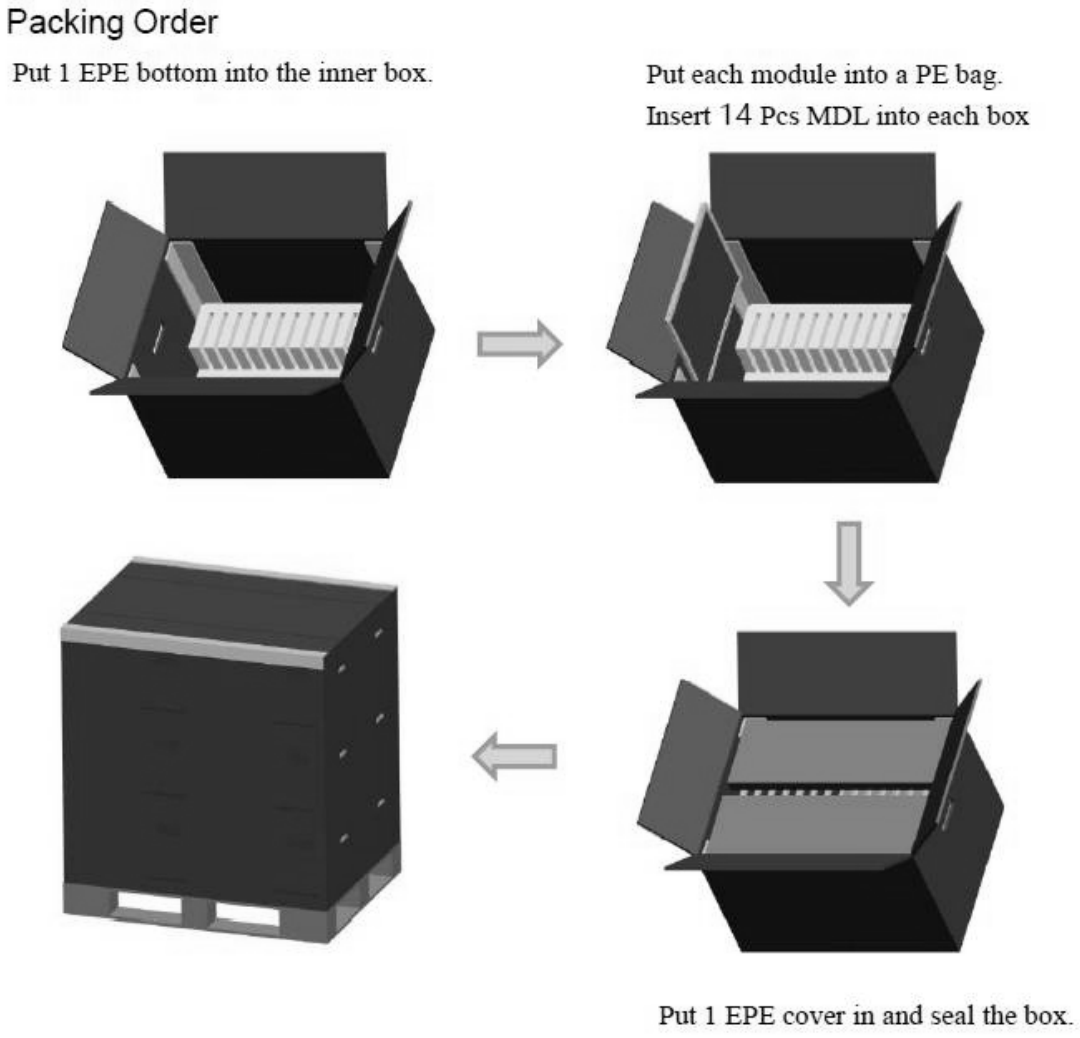


14.5 Inspection quality criteria for TFT LCM

<table>
<tr><th>ITEM</th><th>DESCRIPTION OF DEFECTS</th><th>Zone</th><th>Acceptable level (%)</th></tr>
<tr><td>DIMENSION</td><td>Refer to individual acceptance specification</td><td>A,B,C</td><td>2.5</td></tr>
<tr><td>LINE DEFECT ON SURFACE (SCRATCHES, BLACK/ WHITE LINE)</td><td>(a) L ≦ 2mm & W≦ 0.03mm, disregard
(b) L ≦3mm & 0.03mm < W ≦0.05mm, N ≦ 3
(c) L ≦ 2.5mm & 0.05mm ≦W ≦ 0.1mm, N ≦ 1
(d) W > 0.1mm, as SPOT DEFECT ON SURFACE
  </td><td>A</td><td>2.5</td></tr>
<tr><td>SPOT DEFECT ON SURFACE (BLACK/ WHITE SPOT)</td><td>Average diameter, D
(a) D≦0.2mm, disregard
(b) 0.2mm < D ≦0.5mm, N ≦ 6.ACC
(c) D> 0.5mm, REJ
(d) Distance between 2 spots ≧ 10mm
 
$D=\frac{a+b}{2}$</td><td>A</td><td>2.5</td></tr>
<tr><td>PROTRUDE DOT/ DENT ON SURFACE</td><td>Average diameter D
(a) D≦0.2mm, disregard
(b) 0.2mm < D ≦ 0.3mm, N ≦ 3.ACC
(c) 0.3mm < D ≦ 0.5mm, N ≦ 1.ACC
(d) D> 0.5mm, REJ
 
$D=\frac{a+b}{2}$</td><td>A</td><td>2.5</td></tr>
<tr><td>POLARIZER EDGE</td><td>BUBBLES、DENTS、RESIDUAL GLUE、DECKLE EDGE：
Active Area outside area don’t care.</td><td>A,B</td><td>2.5</td></tr>
<tr><td>BRIGHT/ DARK POINT</td><td>
<table>
<tr><th colspan="2">Item</th><th>Allow number in Area A</th></tr>
<tr><td rowspan="4">(a) Bright point</td><td>Single point</td><td>2</td></tr>
<tr><td>Two adjacent point</td><td>0</td></tr>
<tr><td>Three adjacent point</td><td>0</td></tr>
<tr><td>Total point</td><td>2</td></tr>
<tr><td rowspan="4">(b) Dark point</td><td>Single point</td><td>3</td></tr>
<tr><td>Two adjacent point</td><td>0</td></tr>
<tr><td>Three adjacent point</td><td>0</td></tr>
<tr><td>Total point</td><td>3</td></tr>
</table>
※ Point：A sub pixel 1R or 1G or 1B
※ The distance of bright or dark point > 5mm</td><td>A</td><td>2.5</td></tr>
<tr><td>CHROMA MURA</td><td>Mura and leak are defined through transmission ND 5% filter</td><td>A</td><td>2.5</td></tr>
<tr><td>DISPLAY ABNORMAL</td><td>(a) Non display
(b) Line defect
(c) Response time, contrast ratio, brightness or viewing angle abnormal
(d) Water ripple
(e) Flicker</td><td>A</td><td>0.65</td></tr>
</table>

NOTE：(1) ACC：Accept (2) REJ：Reject

15. PACKING INFORMATION



NOTE：

1.-Put the boxes on the Pallet
2.-12boxes/Pallet:6boxes per layer, total 2 layers
3.-Place paper corners and wrap film around the boxes
4.-Pack with 4 packing belts
5.-Box Dimension :510mm(L)×399mm(W)×324mm(H)
6.-Package Quantity in one Box : 14pcs