



# Specification for Approval

Customer: \_\_\_\_\_

Model Name: \_\_\_\_\_

Supplier Approval			Customer approval
R&D Designed	R&D Approved	QC Approved	
<i>Peter</i>	<i>Peng Jun</i>		

## Revision Record

REV NO.	REV DATE	CONTENTS	Note
A	2024-06-07	NEW ISSUE	

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## 1. Scope

This specification defines general provisions as well as inspection standards for TFT module supplied by AMSON electronics.

If the event of unforeseen problem or unspecified items may occur, naturally shall negotiate and agree to solution

## 2. General Information

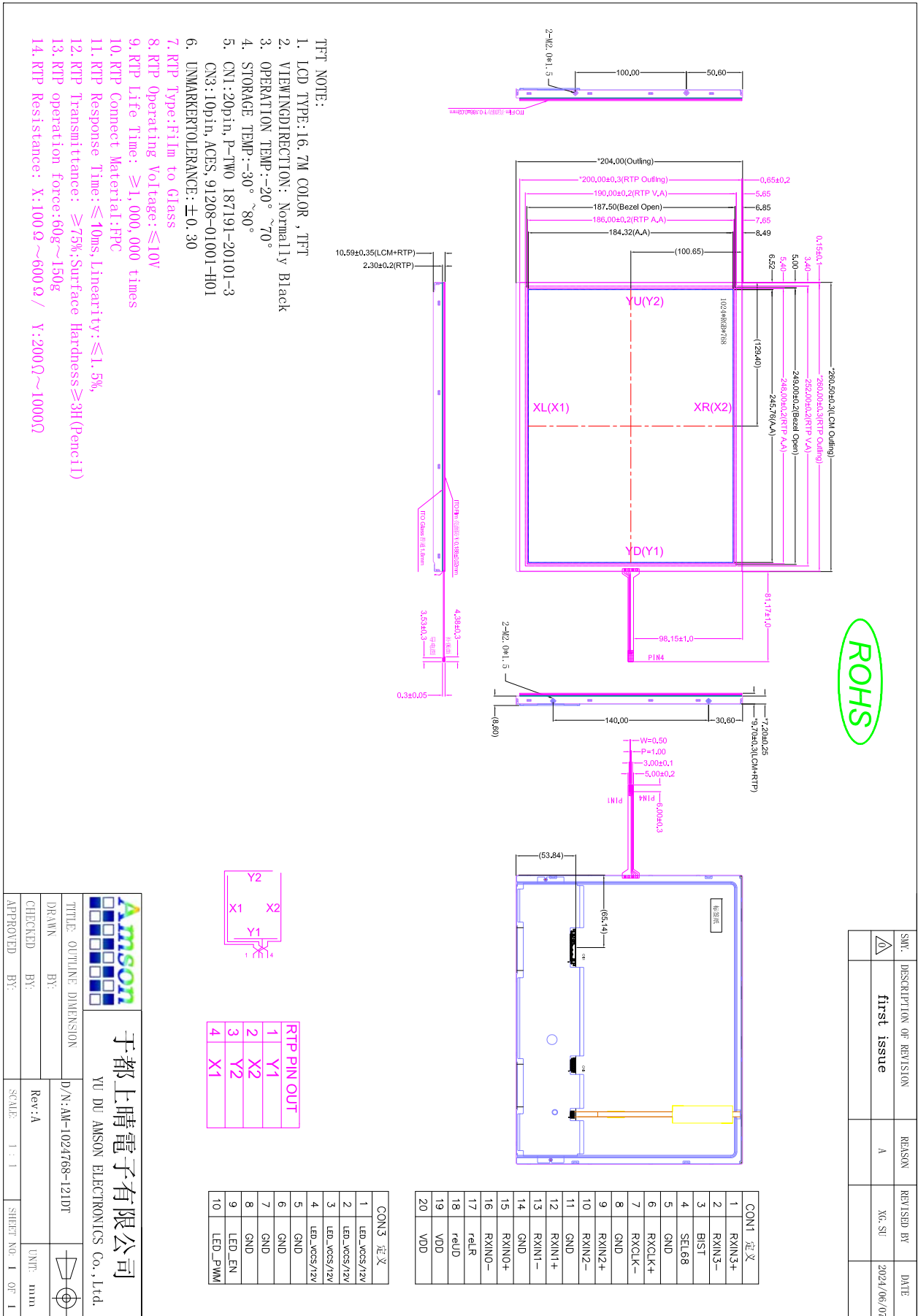
### LCM

ITEM	STANDARD VALUES	UNITS
LCD type	12.1" TFT	--
Dot arrangement	1024 × 3 (RGB) × 768	dots
Color filter array	RGB vertical stripe	--
Display mode	Normally BLACK	--
Viewing Direction	ALL VIEWING	--
Module size	260.50(W) × 204.00(H) × 9.70(T)	mm
Active area	245.76(W) × 184.32(H)	mm
Pixel Pitch	0.08(W) × 0.08(H)	mm
Interface	LVDS	--
Operating temperature	-30 ~ +80	°C
Storage temperature	-30 ~ +80	°C

### RTP

ITEM	STANDARD VALUES	UNITS
RTP type	Film + Glass + FPC	--
Surface hardness	3H	--
Transmittance	≥75%	--
RTP size	260(W) × 200(H) × 2.3(T)	mm
Active area	248(W) × 186.00(H)	mm
Response Time	≤10ms	ms
Linearity	≤1.5%	%
Line writing life	10000	times
Operation force	30~100g	g
Resistance	X:100Ω ~ 600Ω Y:10Ω ~ 1000Ω	Ω

## 3. External Dimensions



## 4. Interface Description

### TFT PIN:

CN1 : Input LVDS CONN,20pins, P-TWO 187191-20101-3

No.	Symbol	I/O	Function
1	RXIN3-	I	Negative LVDS differential data inputs
2	RXIN3+	I	Positive LVDS differential data inputs
3	BIST		Normal operation/BIST pattern select BIST=0: Normal operation BIST=1: BIST mode
4	SEL68	I	LVDS 6/8 bit select function control, SEL68=1: LVDS input data is 6 bit SEL68=0: LVDS input data is 8 bit
5	GND	P	Ground
6	RXCLK-	I	Negative LVDS differential clock inputs
7	RXCLK+	I	Positive LVDS differential clock inputs
8	GND	P	Ground
9	RXIN2-	I	Negative LVDS differential data inputs
10	RXIN2+	I	Positive LVDS differential data inputs
11	GND	P	Ground
12	RXIN1-	I	Negative LVDS differential data inputs
13	RXIN1+	I	Positive LVDS differential data inputs
14	GND	P	Ground
15	RXIN0-	I	Negative LVDS differential data inputs
16	RXIN0+	I	Positive LVDS differential data inputs
17	reLR	I	Left or right display control LR=1: Left-->Right LR=0: Right--> Left
18	reDN	I	Up or Down display control LR=1: Up-->Down LR=0: Down--> Up
19	VCC	P	Digital power
20	VCC	P	

I : input , O : output , P : Power

CN3: Input BL power CONN, 10pins, ACES, 91208-01001-H01

No.	Symbol	I/O	Function
1	LED_VCCS/12V	P	LED backlight (Anode).
2	LED_VCCS/12V	P	LED backlight (Anode).
3	LED_VCCS/12V	P	LED backlight (Anode).
4	LED_VCCS/12V	P	LED backlight (Anode).
5	GND	P	Ground
6	GND	P	Ground
7	GND	P	Ground
8	GND	P	Ground
9	LED_EN	I	Converter power IC output Enable, (Active High)
10	LED_PWM	I	PWM control signal for LED convertor

**RTP PIN:**

No.	Symbol	I/O	Function
1	Y1		Touch panel coordinate PIN
2	X2		Touch panel coordinate PIN
3	Y2		Touch panel coordinate PIN
4	X1		Touch panel coordinate PIN

## 5. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
VDD Digital Supply Voltage	VCC	-0.3	3.8	V
LED_VCCS Digital Supply Voltage	VCC	-0.3	25	V
Operating Temperature	TOP	-30	80	°C
Storage Temperature	TST	-30	80	°C
Storage Humidity	HD	10	90	%RH

## 6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Digital Supply Voltage	VDD	2.75	3.3	3.6	V	-
Backlight Power Voltage	VLED	11	12	13	V	
Digital Supply Current	IDD	-	-	410	mA	VDD=3.3V
Backlight Power Current	LED_VCCS (8S4P)	(400)	-	(425)	mA	LED_VCCS =12V PWM Duty =100%
	LED_VCCS (11S4P)	(600)	-	(635)	mA	LED_VCCS =12V PWM Duty =100%
Input logic high voltage	VIH	0.7*VDD	-	VDD	V	-
Input logic low voltage	VIL	GND	-	0.3*VDD	V	
LED_EN Control Level	BL On	3.0		5	V	
	BL Off	0		0.3	V	
LED_PWM Control Level	PWM High	3.0		5	V	
	PWM Low	0		0.3	V	
PWM Frequency	LED_PWM	1K		20K	Hz	



## 7. Timing Characteristics

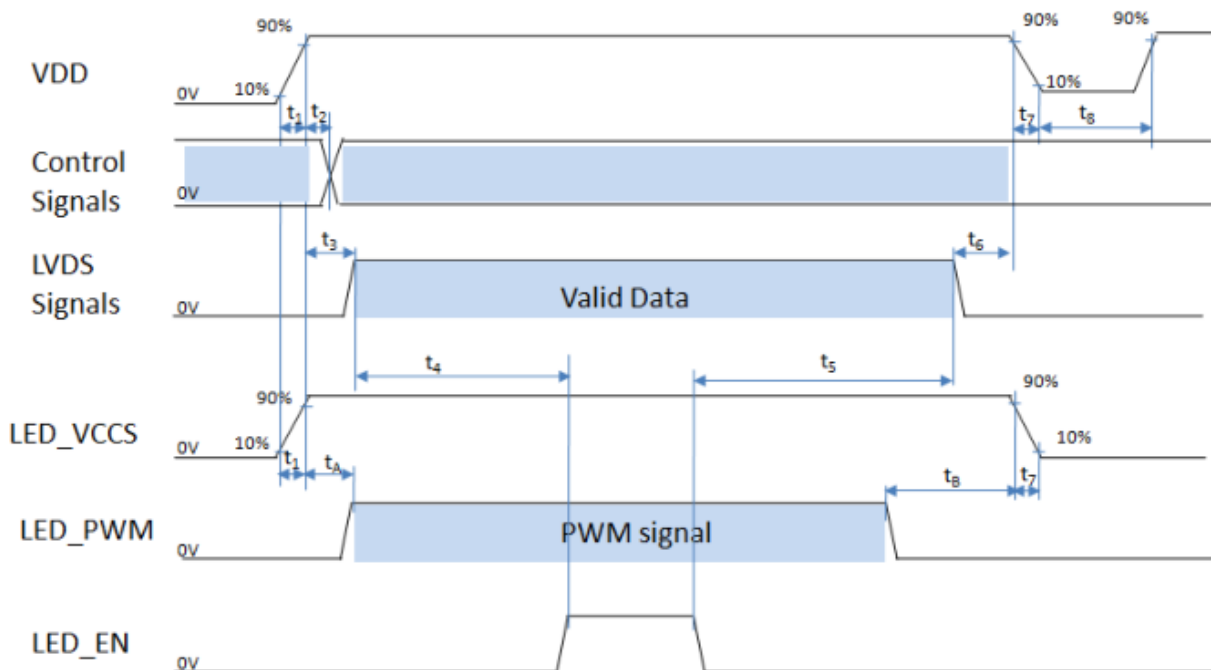
### 7.1 Power sequence

In order to prevent IC from power on reset fail, the rising time (TPOR) of the digital power supply VDD should be maintained within the given specifications. Refer to “AC Characteristics” for more detail on timing.

#### 7.1.1 Power on/off timing sequence

The power sequence specifications are shown as the following table and diagram.

Symbol	Value		Unit
	Min.	Max.	
t <sub>1</sub>	1	20	ms
t <sub>2</sub>	1	5	ms
t <sub>3</sub>	10	50	ms
t <sub>4</sub>	200	500	ms
t <sub>5</sub>	200	500	ms
t <sub>6</sub>	50	200	ms
t <sub>7</sub>	0	20	ms
t <sub>8</sub>	500	-	ms
t <sub>A</sub>	0	50	ms
t <sub>B</sub>	0	50	ms



Note 1: Please don't plug the interface cable of on when system is turned on.

Note 2: Please avoid floating state of the interface signal during signal invalid period.

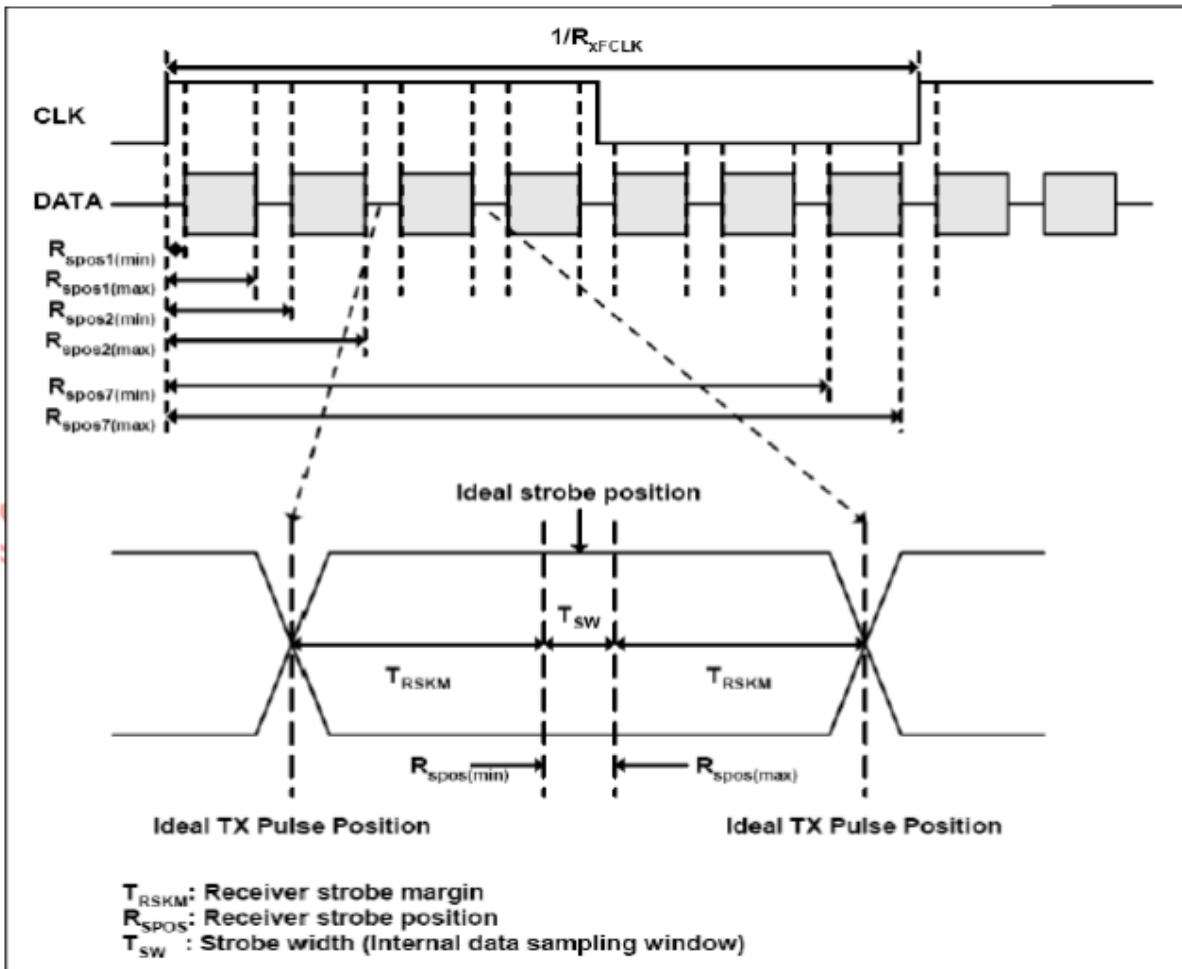
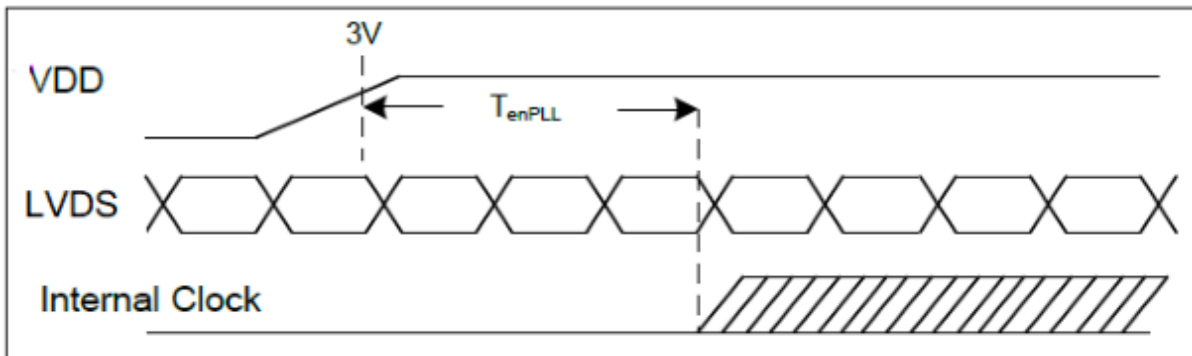
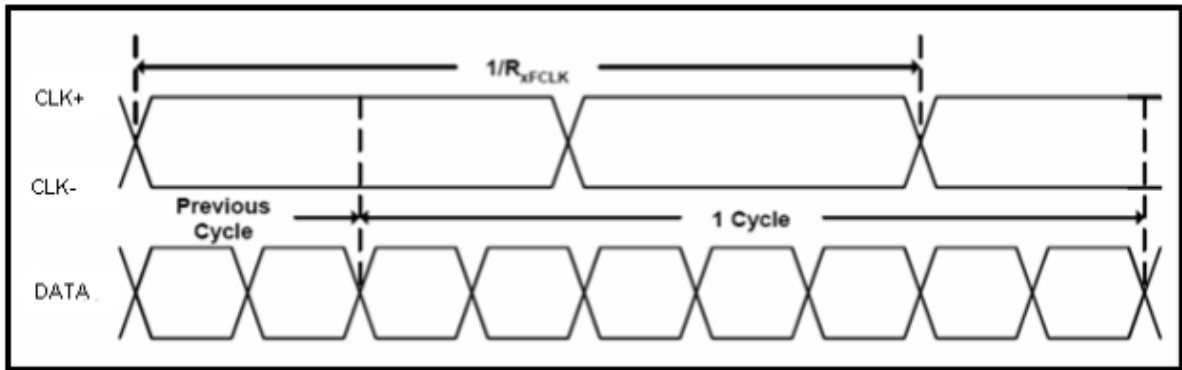
Note 3: It is recommended that the backlight power must be turned on after the power supply for LCD and the interface signal is valid.

Note 4: Control signals include SEL68 , reUD & reLR.

## 7.2 AC Electrical Characteristics

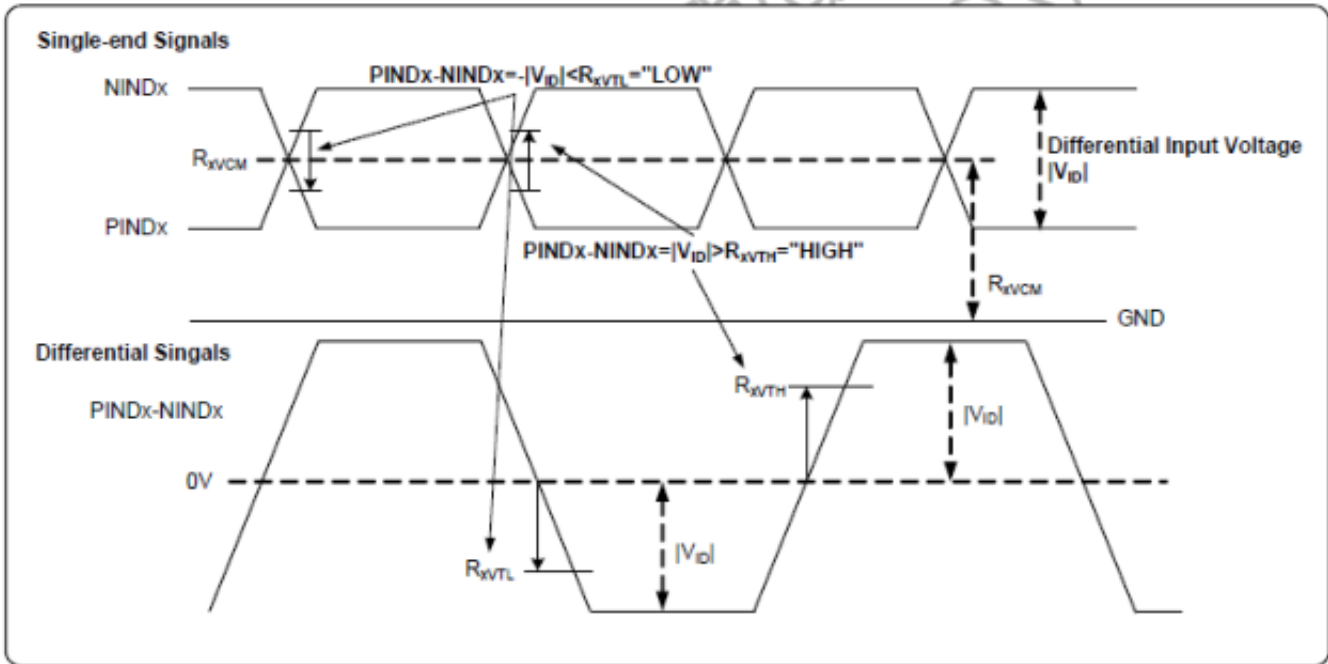
Parameter	Symbol	Min	Typ	Max	Units	Condition
Clock frequency	RxFCLK	26.2	-	71	MHz	
Input data skew margin	TRSKM	500	-	-	ps	VID   = 400mV RxVCM=1.2V RxFCLK=71MHz
Clock high time	TLVCH	-	$4/(7 \times \text{RxFCLK})$	-	ns	
Clock low time	TLVCL	-	$3/(7 \times \text{RxFCLK})$	-	ns	
PLL wake-up time	TenPLL	-	-	150	us	

## 7.3 Input clock and data timing diagram



## 7.4 DC electrical characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LVDS Differential input high Threshold voltage	$R_{xVTH}$	-	-	+100	mV	$R_{xVCM}=1.2V$
LVDS Differential input low Threshold voltage	$R_{xVTL}$	-100	-	-	mV	
Input Voltage range (Singed-end)	$R_{xVIN}$	0	-	2.4	V	
LVDS Differential input common mode voltage	$R_{xVCM}$	$ V_{ID} /2$	-	$2.4- V_{ID} /2$	V	
LVDS Differential input voltage	$ V_{ID} $	0.2	-	0.6	V	

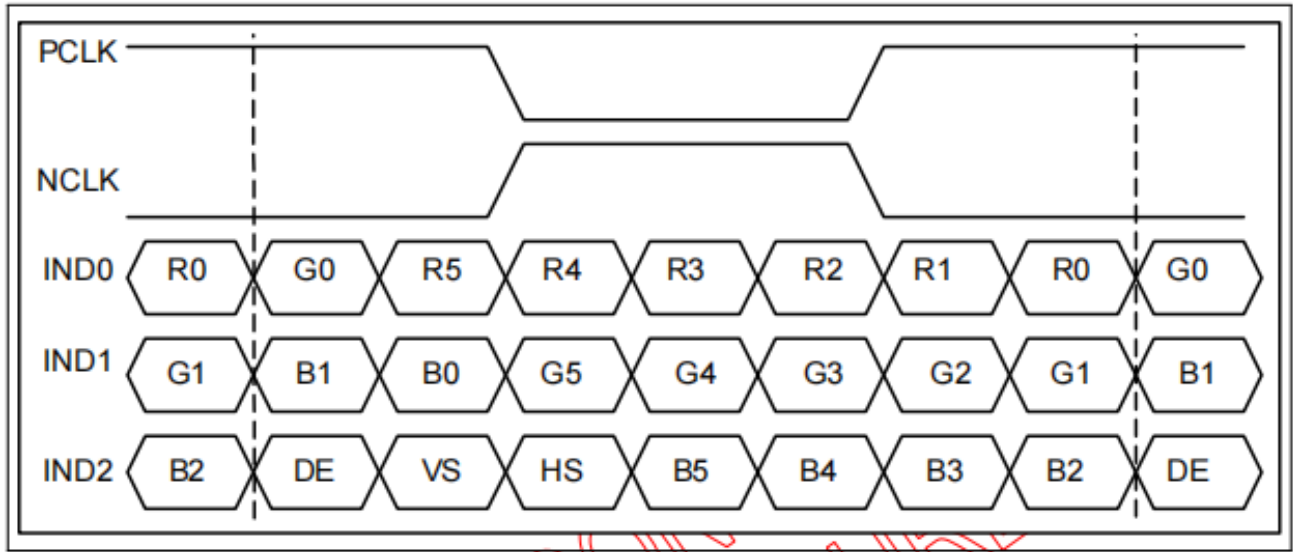


## 7.5 Data Timing

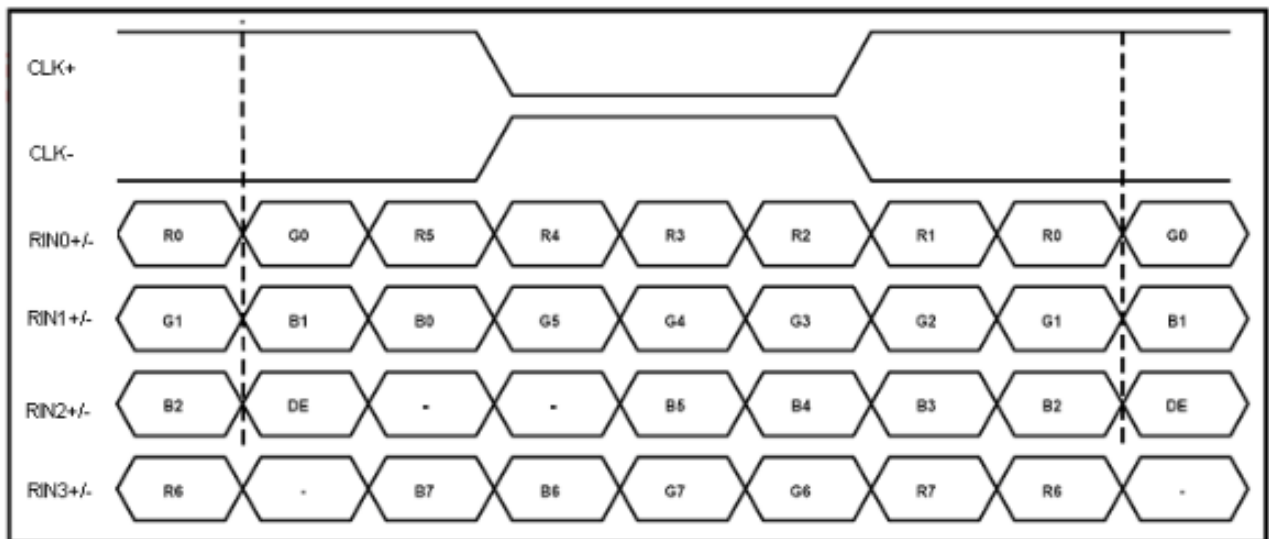
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	52	65	71	MHz
Horizontal display area	thd	1024			DCLK
HSD period	th	1114	1344	1400	DCLK
HSD blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd	768			$T_H$
VSD period	tv	778	806	845	$T_H$
VSD blanking	tvbp+tvfp	10	38	77	$T_H$

## 7.6 Data Input Format for LVDS

**SELB Set: "High" for 6 bits LVDS Input**



**SELB Set: "Low" for 8 bits LVDS Input**



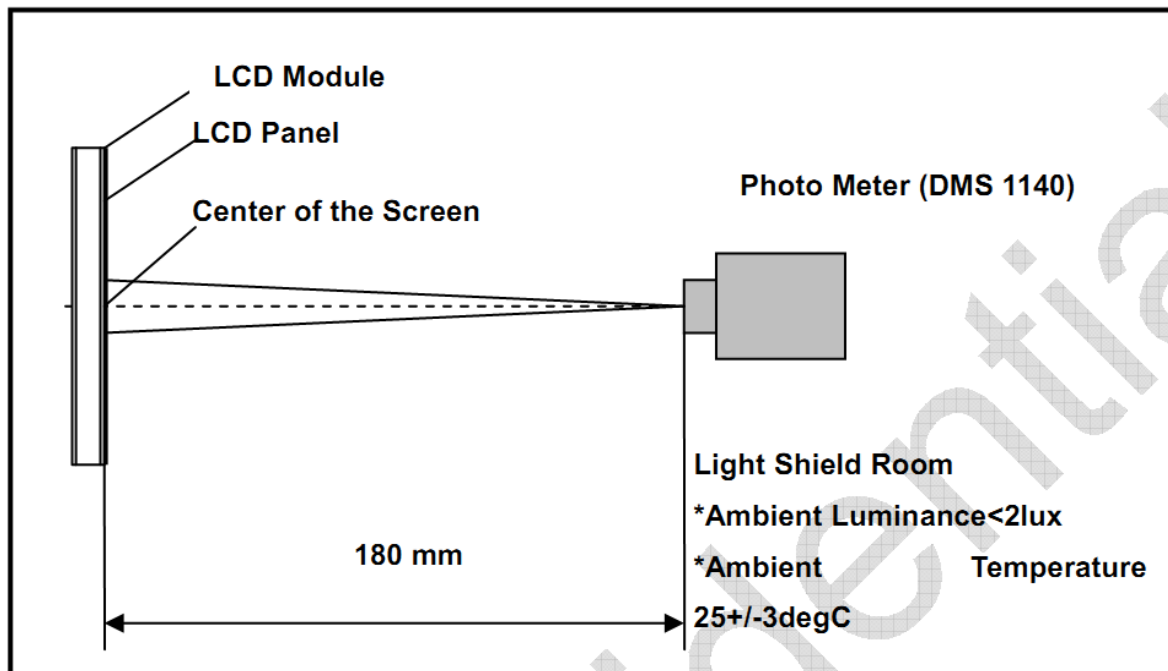
## 8. Backlight Characteristic

Item	Symbol	MIN	TYP	MAX	UNIT	NOTE
Lifetime		50000	-	-	Hr	
Color	White					
Luminous Intensity for LCM and TP	LED_PWM =100%	800	1000	-	cd/m2	
Luminance uniformity		80	-	-	%	

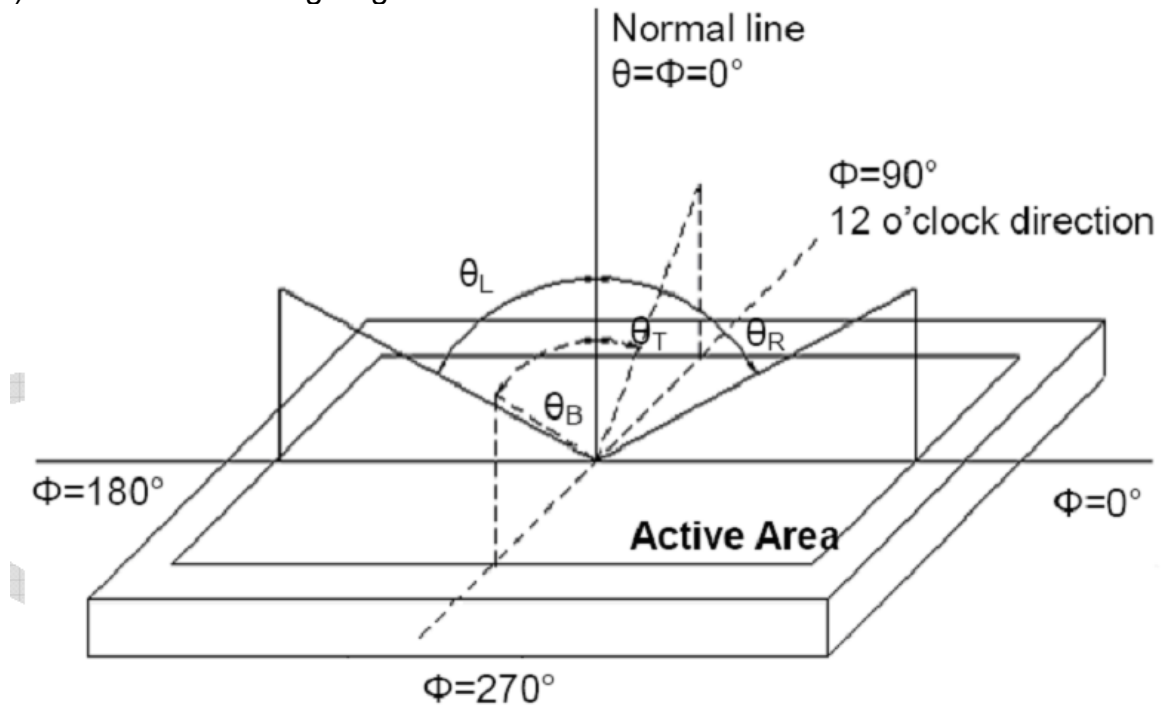
## 9. Optical Characteristics

Item	Conditions	Min.	Typ.	Max.	Unit	Note	
Viewing Angle (CR>10)	Horizontal	$\theta_L$	85	89	-	degree	(1),(2),(6)
		$\theta_R$	85	89	-		
	Vertical	$\theta_T$	85	89	-		
		$\theta_B$	85	89	-		
Contrast Ratio	Center	700	1000	-	-	(1),(3),(6)	
Response Time	Rising + Falling	-	25	35	ms	(1),(4),(6)	
CF Color Chromaticity (CIE1931)	Red x	Typ. -0.05	Typ. +0.05	-	(1), (6)		
	Red y			-			
	Green x			-			
	Green y			-			
	Blue x			-			
	Blue y			-			
	White x			0.305			
	White y			0.347			

Note (1) Measurement Setup: The LCD module should be stabilized at given temp. 25°C for 15 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.



Note (2) Definition of Viewing Angle



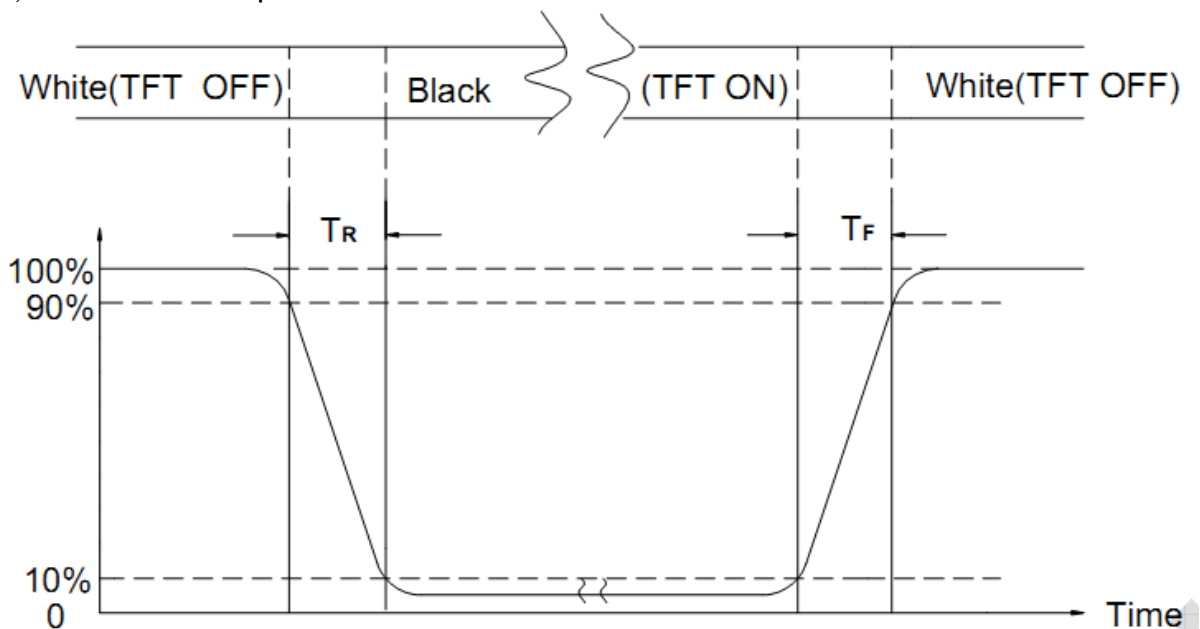
Note (3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

L63: Luminance of gray level 63, L0: Luminance of gray level 0

Note (4) Definition of response time



Note (5) Definition of Transmittance (Module is without signal input)

$$\text{Transmittance} = \text{Center Luminance of LCD} / \text{Center Luminance of Back Light} \times 100\%$$

Note (6) Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of LCD



## 10. Reliability Test Conditions and Methods

NO.	Test Items	Test Condition											
①	High Temperature Storage	Keep in $80^{\circ}\text{C} \pm 2^{\circ}\text{C} \times 96\text{Hrs}$ Surrounding temperature, then storage at normal condition 4hrs.											
②	Low Temperature Storage	Keep in $-30^{\circ}\text{C} \pm 2^{\circ}\text{C} \times 96\text{Hrs}$ Surrounding temperature, then storage at normal condition 4hrs.											
③	High Temperature Operating Test	Keep in $80^{\circ}\text{C} \pm 2^{\circ}\text{C} \times 96\text{Hrs}$ Surrounding temperature, then storage at normal condition 4hrs.											
④	Low Temperature Operating Test	Keep in $-30^{\circ}\text{C} \pm 2^{\circ}\text{C} \times 96\text{Hrs}$ Surrounding temperature, then storage at normal condition 4hrs.											
⑤	High Temperature / High Humidity Storage Test	Keep in $60^{\circ}\text{C} \pm 5^{\circ}\text{C} \times 90\% \text{RH} \times 96\text{Hrs}$ Surrounding temperature, then storage at normal condition 4hrs.											
⑥	Temperature Cycling Storage Test	$  \begin{array}{ccccccc}  -30^{\circ}\text{C} & \rightarrow & +25^{\circ}\text{C} & \rightarrow & 80^{\circ}\text{C} & \rightarrow & +25^{\circ}\text{C} \\  (30\text{mins}) & & (5\text{mins}) & & (30\text{mins}) & & (5\text{mins}) \\  \longleftarrow & & & & & & \longrightarrow \\  & & & & 30 \text{ Cycle} & &   \end{array}  $ Surrounding temperature, then storage at normal condition 4hrs.											
⑦	ESD Test	Air Discharge: Apply 6 KV with 5 times Discharge for each polarity +/-	Contact Discharge: Apply 4 KV with 5 times discharge for each polarity +/-										
		1. Temperature ambience : $15^{\circ}\text{C} \sim 35^{\circ}\text{C}$ 2. Humidity relative : $30\% \sim 60\%$ 3. Energy Storage Capacitance (Cs + Cd): $150\text{pF} \pm 10\%$ 4. Discharge Resistance (Rd): $330\Omega \pm 10\%$ 5. Discharge, mode of operation: Single Discharge (time between successive discharges at least 1 sec) (Tolerance if the output voltage indication : $\pm 5\%$ )											
⑧	Vibration Test (Packaged)	1. Sine wave $10 \sim 55$ Hz frequency (1 min/sweep) 2. The amplitude of vibration : 1.5 mm 3. Each direction (X、Y、Z) duration for 2Hrs											
⑨	Drop Test (Packaged)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Packing Weight (Kg)</th> <th>Drop Height (cm)</th> </tr> </thead> <tbody> <tr> <td>0 ~ 45</td> <td>122</td> </tr> <tr> <td>45.4 ~ 90.8</td> <td>76</td> </tr> <tr> <td>90.8 ~ 454</td> <td>61</td> </tr> <tr> <td>Over 454</td> <td>46</td> </tr> </tbody> </table>		Packing Weight (Kg)	Drop Height (cm)	0 ~ 45	122	45.4 ~ 90.8	76	90.8 ~ 454	61	Over 454	46
		Packing Weight (Kg)	Drop Height (cm)										
0 ~ 45	122												
45.4 ~ 90.8	76												
90.8 ~ 454	61												
Over 454	46												
		Drop Direction: ※1 corner / 3 edges / 6 sides each 1time											

## 11. Inspection Standard

### 11. Inspection Standards

#### 11.1. Quality

The quality of goods supplied to purchaser shall come up to the following standards:

##### 11.1.1. Inspection Tools and Instruments

Vernier calipers, film scales, multimeter, magnifying eyepiece, ND5%, luminance meter and so on.

##### 11.1.2. The Method of Preserving Goods

After delivery of goods from AMSON to purchaser, purchaser shall keep the LCM at -10°C to 30°C, and it might be desirable to keep at the normal room temperature and humidity until incoming inspection or throwing into process line.

##### 11.1.3. Incoming Inspection

###### (A) The methods of Inspection

If purchaser makes an incoming inspection, a sampling plan shall be applied on The condition that quality of one delivery shall be regarded as one lot.

###### (B) The standard of quality:

ISO-2859-1 (same as MIL-STD-105E ), Level: II

CLASS	AQL (%)
Critical	0.4 %
Major	0.65 %
Minor	1.5 %

Every item shall be inspected according to the class.

###### (C) Measure

If as the result of above receiving inspection, a lot out is discovered, purchaser Shall inform seller of it within seven days. But first shipment within fourteen days.

##### 11.1.4. Warranty Policy

AMSON will provide one-year warranty for the products only if under Specification operating conditions. AMSON will replace new products for these defect products which are under warranty period and belong to the responsibility of AMSON.

## 11.2. CHECKING CONDITION

11.2.1. Checking direction shall be in the 45 degree area to face the sample.

11.2.2. Inspector shall see from over 300±25mm with bare eyes far from the sample.

11.2.3. Ambient Illumination:

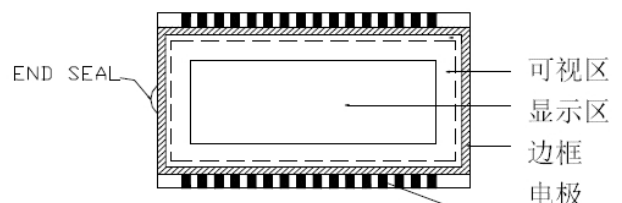
0 ~30 Lux for functional inspection

500 ~ 1200 Lux for external appearance inspection.

11.2.4. TEST AREA:



11.2.5. Inspection should be carried out with rope electrostatic ring and static finger cover (both hands except small fingers must be worn)



**11.2.6.** The inspector may make a visual inspection or a comparative examination with a film ruler and a magnifying eyepiece. Individual defects shall be determined according to the limited samples.

**11.2.7.** Functional testing uses electrical testing fixtures or test fixtures required by customers.

**11.2.8.** The ion fan should be used when testing.

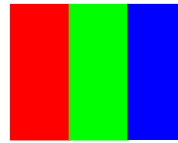
### **11.2.9. The principle of judgment**

11.3.1 If the defect outside the visual area does  
Not affect the assembly and display,  
It will be judged as a good product.

11.3.2 Poor definition

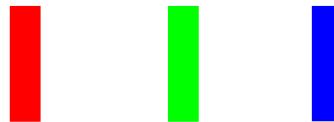
Pixel:

A combination of three sub-pixels  
(Red + Green + Blue).



**Dot:**

Any of the sub-pixels  
(Red or Green or Blue).



#### **Bright and dark dots:**

A point pixel (sub-pixel: R, G, B pixels) is lit or turned off during the display function test.

#### **Highlights:**

Usually considered to be shown on a black screen.

#### **Dark spots:**

They are generally considered to be shown on R, G, B solid colors or white images.

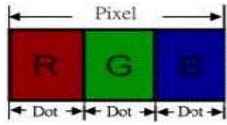
#### **Neighborhood:**

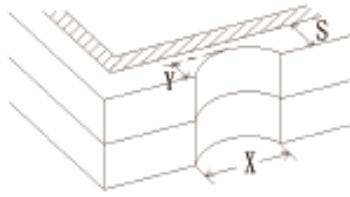
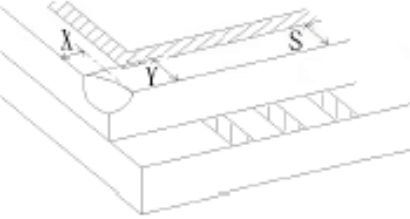
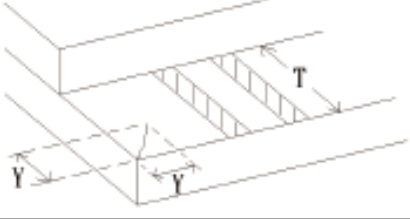
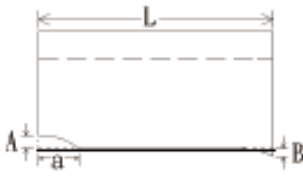
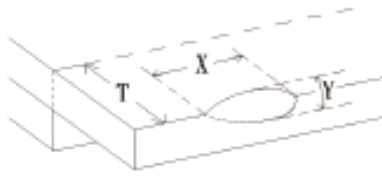
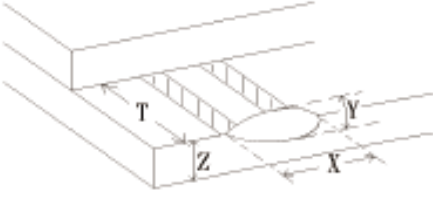

Two or three adjacent point pixels (dot: sub-pixel) connected together (R, G or G, B or B, R or RGB).

11.3. INSPECTION PLAN :

CLASS	ITEM	JUDGEMENT	CLASS
PACKING & INDICATE	1. OUTSIDE AND INSIDE PACKAGE	"MODEL NO." , "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE.	Minor
	2. MODEL MIXED AND QUANTITY	OTHER MODEL MIXED.....REJECTED QUANTITY SHORT OR OVER.....REJECTED	Critical
	3. PRODUCT INDICATION	"MODEL NO." SHOULD INDICATE ON THE PRODUCT	Major
ASSEMBLY	4. DIMENSION, LCD GLASS SCRATCH AND SCRIBE DEFECT.	ACCORDING TO SPECIFICATION OR DRAWING.	Major
APPEARANCE	5. VIEWING AREA	POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREA .....REJECTED	Minor
	6. BLEMISH · BLACK SPOT · WHITE SPOT IN THE LCD AND LCD GLASS CRACKS	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	7. BLEMISH · BLACK SPOT WHITE SPOT AND SCRATCH ON THE POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	8. BUBBLE IN POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	9. LCD'S RAINBOW COLOR	STRONG DEVIATION COLOR ( OR NEWTON RING) OF LCD.....REJECTED. OR ACCORDING TO LIMITED SAMPLE ( IF NEEDED, AND INSIDE VIEWING AREA )	Minor
ELECTRICAL	10. ELECTRICAL AND OPTICAL CHARACTERISTICS ( CONTRAST· VOP · CHROMATICITY ... ETC )	ACCORDING TO SPECIFICATION OR DRAWING . ( INSIDE VIEWING AREA )	Critical
	11.MISSING LINE	MISSING DOT · LINE · CHARACTER .....REJECTED	Critical
	12.SHORT CIRCUIT· WRONG PATTERN DISPLAY	NO DISPLAY · WRONG PATTERN DISPLAY · CURRENT CONSUMPTION OUT OF SPECIFICATION..... REJECTED	Critical
	13. DOT DEFECT (FOR COLOR AND TFT)	ACCORDING TO STANDARD OF VISUAL INSPECTION	Minor

## 1.4. STANDARD OF VISUAL INSPECTION

NO.	CLASS	ITEM	JUDGEMENT									
11.4.1	MINOR	BLACK AND WHITE SPOT FOREIGN MATERIEL DUST IN THE CELL BLEMISH SCRATCH	<p>(A) ROUND TYPE: <span style="float: right;">unit: mm</span></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">DIAMETER (mm.)</th> <th style="width: 50%;">ACCEPTABLE Q'TY</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><math>\varnothing \leq 0.2</math></td> <td style="text-align: center;">Disregard <math>\geq 1\text{mm}</math></td> </tr> <tr> <td style="text-align: center;"><math>0.2 &lt; \varnothing \leq 0.4</math></td> <td style="text-align: center;">3 (Distance <math>\geq 15\text{mm}</math>)</td> </tr> <tr> <td style="text-align: center;"><math>0.4 &lt; \varnothing</math></td> <td style="text-align: center;">0</td> </tr> </tbody> </table> <p style="text-align: center;">NOTE: <math>\varnothing = (\text{LENGTH} * \text{WIDTH}) / 2</math></p>	DIAMETER (mm.)	ACCEPTABLE Q'TY	$\varnothing \leq 0.2$	Disregard $\geq 1\text{mm}$	$0.2 < \varnothing \leq 0.4$	3 (Distance $\geq 15\text{mm}$ )	$0.4 < \varnothing$	0	
			DIAMETER (mm.)	ACCEPTABLE Q'TY								
$\varnothing \leq 0.2$	Disregard $\geq 1\text{mm}$											
$0.2 < \varnothing \leq 0.4$	3 (Distance $\geq 15\text{mm}$ )											
$0.4 < \varnothing$	0											
<p>(S) LINEAR TYPE: <span style="float: right;">unit: mm</span></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">LENGTH</th> <th style="width: 33%;">WIDTH</th> <th style="width: 33%;">ACCEPTABLE QTY</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">.....</td> <td style="text-align: center;"><math>W \leq 0.03</math></td> <td style="text-align: center;">Disregard <math>\geq 1\text{mm}</math></td> </tr> <tr> <td style="text-align: center;"><math>L \leq 4.0</math></td> <td style="text-align: center;"><math>0.03 &lt; W \leq 0.05</math></td> <td style="text-align: center;">3 (Distanced <math>\geq 15\text{mm}</math>)</td> </tr> <tr> <td style="text-align: center;">.....</td> <td style="text-align: center;"><math>0.05 &lt; W</math></td> <td style="text-align: center;">FOLLOW ROUND TYPE</td> </tr> </tbody> </table>	LENGTH	WIDTH	ACCEPTABLE QTY	.....	$W \leq 0.03$	Disregard $\geq 1\text{mm}$	$L \leq 4.0$	$0.03 < W \leq 0.05$	3 (Distanced $\geq 15\text{mm}$ )	.....	$0.05 < W$	FOLLOW ROUND TYPE
LENGTH	WIDTH	ACCEPTABLE QTY										
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.....	$0.05 < W$	FOLLOW ROUND TYPE										
11.4.2	MINOR	BUBBLE IN POLARIZER DENT ON POLARIZER	<p style="text-align: right;">unit: mm.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">DIAMETER</th> <th style="width: 50%;">ACCEPTABLE Q'TY</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><math>\varnothing &lt; 0.2</math></td> <td style="text-align: center;">Disregard <math>\geq 1\text{mm}</math></td> </tr> <tr> <td style="text-align: center;"><math>0.2 &lt; \varnothing \leq 0.5</math></td> <td style="text-align: center;">2(Distance <math>\geq 15\text{mm}</math>)</td> </tr> <tr> <td style="text-align: center;"><math>0.5 &lt; \varnothing</math></td> <td style="text-align: center;">0</td> </tr> </tbody> </table>	DIAMETER	ACCEPTABLE Q'TY	$\varnothing < 0.2$	Disregard $\geq 1\text{mm}$	$0.2 < \varnothing \leq 0.5$	2(Distance $\geq 15\text{mm}$ )	$0.5 < \varnothing$	0	
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11.4.3	MINOR	Dot Defect	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Items</th> <th style="width: 50%;">ACC. Q'TY</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Bright dot</td> <td style="text-align: center;"><math>N \leq 2</math>(Distance <math>\geq 15\text{mm}</math>)</td> </tr> <tr> <td style="text-align: center;">Dark dot</td> <td style="text-align: center;"><math>N \leq 2</math>(Distance <math>\geq 15\text{mm}</math>)</td> </tr> </tbody> </table> <p>Pixel Define :</p> <div style="text-align: center;">  </div> <p>Note:</p> <ol style="list-style-type: none"> <li>The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot. Definition: <math>&lt; 1/2</math> dot and visible by 5% ND filter</li> <li>Bright dot: Dots appear bright and unchanged in size m which LCD panel is displaying under black pattern.</li> <li>Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure Red, Green, Blue pattern.</li> </ol>	Items	ACC. Q'TY	Bright dot	$N \leq 2$ (Distance $\geq 15\text{mm}$ )	Dark dot	$N \leq 2$ (Distance $\geq 15\text{mm}$ )			
Items	ACC. Q'TY											
Bright dot	$N \leq 2$ (Distance $\geq 15\text{mm}$ )											
Dark dot	$N \leq 2$ (Distance $\geq 15\text{mm}$ )											
11.4.4	MINOR	Mura	Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary									

NO.	CLASS	ITEM	JUDGEMENT
11.4.5	MINOR	LCD GLASS CHIPPING	 <p><math>X \geq 3\text{mm}</math> <math>Y &gt; S</math>      Reject</p>
11.4.6	MINOR	LCD GLASS CHIPPING	 <p><math>X \text{ or } Y &gt; S</math>      Reject</p>
11.4.7	MAJOR	LCD GLASS GLASS CRACK	 <p>Continuous burst NG      Reject</p>
11.4.8	MAJOR	LCD GLASS SCRIBE DEFECT	 <p>ACCORDING TO DIMENSION</p>
11.4.9	MINOR	LCD GLASS CHIPPING ( ON THE TERMINAL AREA )	 <p><math>Y &lt; 1/2Z</math> <math>Y \geq 0.5\text{mm}</math>      Reject <math>X \geq 3\text{mm}</math></p>
11.4.10	MINOR	LCD GLASS CHIPPING ( ON THE TERMINAL SURFACE )	 <p><math>Y &lt; 1/2Z</math> <math>Y \geq 0.5\text{mm}</math>      Reject <math>X \geq 3\text{mm}</math></p>
11.4.11	MINOR	LCD GLASS CHIPPING	 <p><math>X \geq 3\text{mm}</math> <math>Y \geq T</math>      Reject</p> <p>If touch the electrode lines, the need to retain the two-thirds electrode lines</p>

## 12. Handling Precautions

### 12.1 Mounting method

The LCD panel of AMSON TFT module consists of two thin glass plates with polarizers which easily be damaged. And since the module is so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

### 12.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent

[Recommended below] and wipe lightly

- Isopropyl alcohol
- Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated:

- Soldering flux
- Chlorine (Cl) , Sulfur (S)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happens by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

### 12.3 Caution against static charge

The LCD module uses C-MOS LSI drivers, so we recommend that you:

Connect any unused input terminal to power or ground, do not input any signals before power is turned on, and ground your body, work/assembly areas, and assembly equipment to protect against static electricity.

### 12.4 packing

- Module employs LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity

### 12.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- Slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the maximum operating temperature, 50%Rh or less is required.

## 12.6 storing

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it . And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.  
[It is recommended to store them as they have been contained in the inner container at the time of delivery from us

## 12.7 Safety

- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water

## 13. Precaution for Use

### 13.1

A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

### 13.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this specification.
- When a new problem is arisen which is not specified in this specifications?
- When an inspection specifications change or operating condition change in customer is reported to AMSON TFT and some problem is arisen in this specification due to the change.
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

## 14. Packing Method

TBD