

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>		

Table of Contents

List	Description	Page No.
	Cover	1
	Revision Record	2
	Table of Contents	3
1	Scope	4
2	General Information	4
3	External Dimensions	5
4	Interface Description	6
5	Absolute Maximum Ratings	9
6	Electrical Characteristics	9
7	Timing Characteristics	10
8	Backlight Characteristics	12
9	Touch Panel	13
10	Optical Characteristics	14
11	Reliability Test Conditions And Methods	16
12	Handling Precautions	17
13	Precaution for Use	18
14	Packing Method	18

1. Scope

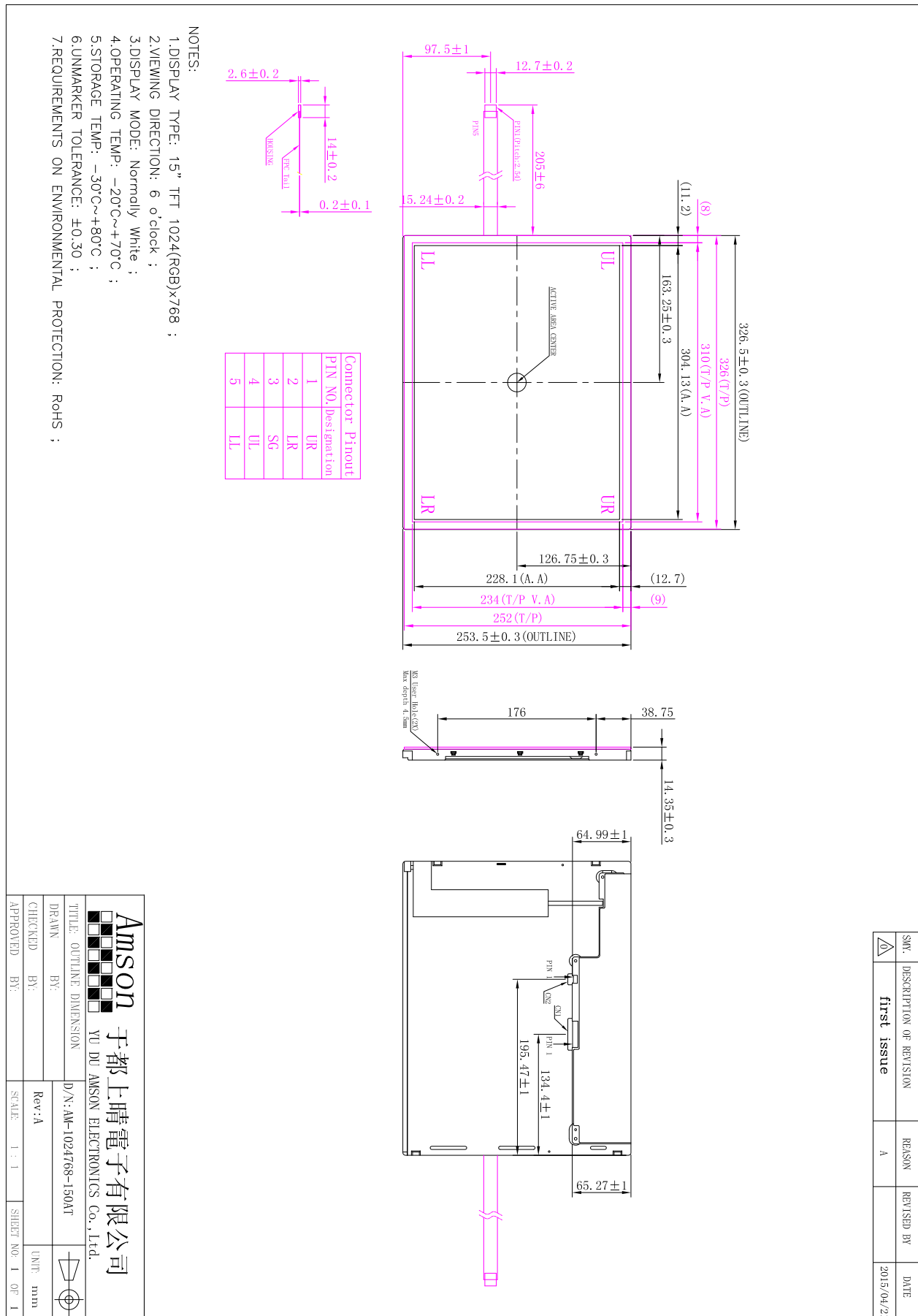
This specification defines general provisions as well as inspection standards for TFT module supplied by AMSON electronics.

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

2. General Information

ITEM	STANDARD VALUES	UNITS
LCD type	15.0" TFT+RTP	--
Dot arrangement	1024×3(RGB)×768	dots
Color Pixel Arrangement	RGB vertical stripe	--
Display Mode	TN / Transmissive / Normally white	--
Viewing Direction	6 o'clock	--
Module size	326.5(W)×253.5(H)×14.35(T)	mm
Active area	304.128(W)×228.096(H)	mm
Dot pitch	0.297 (W)×0.297 (H)	mm
Interface	LVDS Interface	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Weight	TBD	g

3. External Dimensions



4. Interface Description

4.1 TFT Interface (CN1)

Pin NO.	SYMBOL	DESCRIPTION
1	VDD	Power supply
2	VDD	Power supply
3	VSS	Ground
4	REV	Reverse scan selection
5	Rin1-	-LVDS differential data input(R0-R5,G0)
6	Rin1+	+LVDS differential data input(R0-R5,G0)
7	VSS	Ground
8	Rin2-	- LVDS differential data input
9	Rin2+	+LVDS differential data input
10	VSS	Ground
11	Rin3-	- LVDS differential data input
12	Rin3+	+LVDS differential data input
13	VSS	Ground
14	CIkIN-	- LVDS differential clock input
15	CIkIN+	+LVDS differential clock input
16	VSS	Ground
17	Rin4-	- LVDS differential data input
18	Rin4+	+LVDS differential data input
19	VSS	Ground
20	NC	No connection

【Note 1】 REV=LOW/NC

Gate scan:

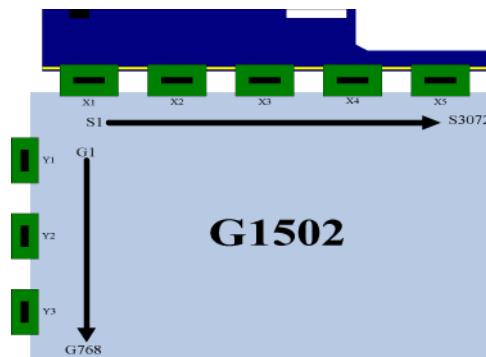
Y1→Y2→Y3

Y1 : G1→G2 -----→G258

Source scan:

X1→X2→X3→X4→X5

X1 : S1→ S2 -----→S600



【Note 2】 REV=High

Gate scan:

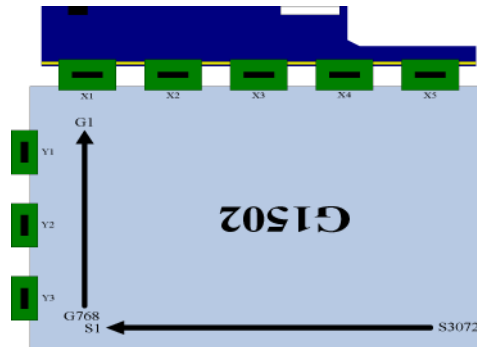
Y3→Y2→Y1

Y1 : G258→G257 -----→G1

Source scan:

X5→X4→X3→X2→X1

X1 : S600→ S599 -----→S1



4.2 LED Interface (CN2)

4.2.1 Connector Name /Designation

Connector Name/Designation	LED Driver Connector
Manufacturer	STM or compatible
Connector Model Number	MSB24038P5A or compatible
Mating Model Number	P24038P5A or compatible

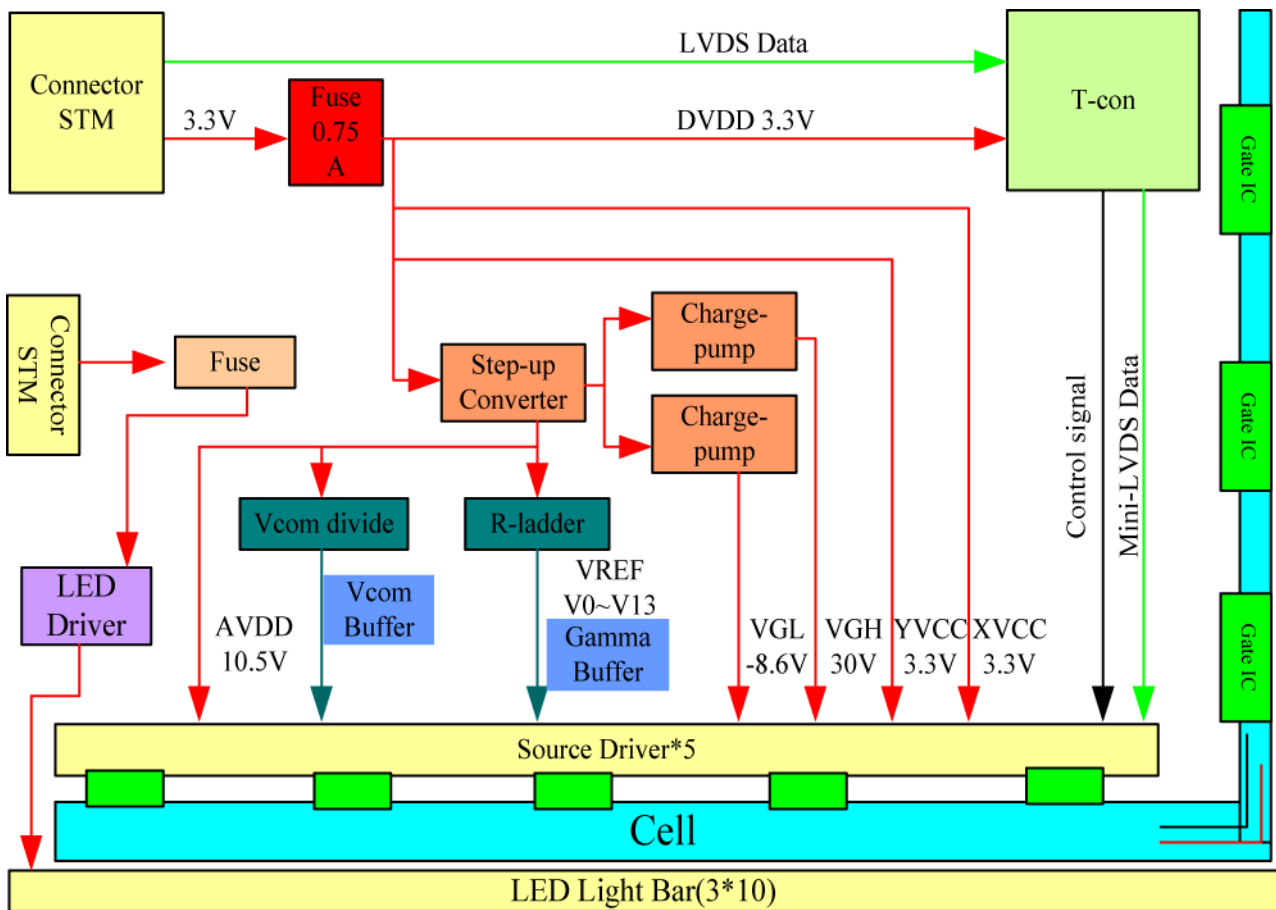
4.2.2 LED Connector Pin Assignment

Pin NO.	SYMBOL	SIGNAL NAME
1	VCC	12V
2	GND	Ground
3	Enable	5V-on / 0V-off
4	Dimming	PWM Dimming or Analog Dimming
5	NC	No connection

4.3 Resistance Touch Panel Interface

Pin NO.	SYMBOL
1	UR
2	LR
3	SG
4	UL
5	LL

4.4 TFT Functional Block Diagram



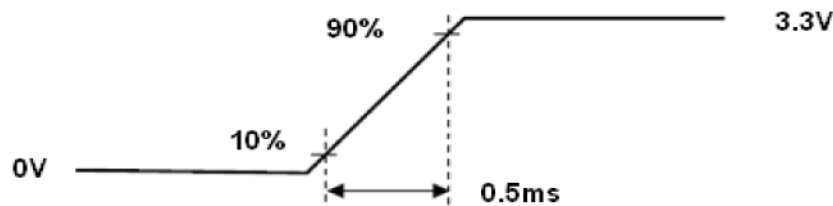
5. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VDD	-0.5	5.0	V
Operating Temperature	T _{OP}	-20	70	°C
Storage Temperature	T _{ST}	-30	80	°C
Storage Humidity	HD	20	90	%RH

6. DC Characteristics

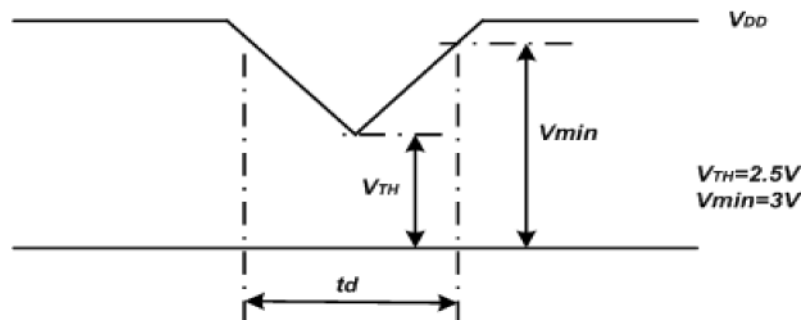
Item	Symbol	Min	Typ	Max	Unit
Logic/LCD Drive Voltage	VDD	3.0	3.3	3.6	V
VDD current	IDD	-	0.25	-	A
VDD Power	PDD	-	-	1.3	W
Rush Current	I _{rush}	-	-	3	A
Allowable logic/LCD Drive Ripple Voltage	VDD _{rp}	-	-	200	mVp-p

【Note 1】 Measure Condition



VDD rising time

【Note 2】 VDD Power Dip Condition

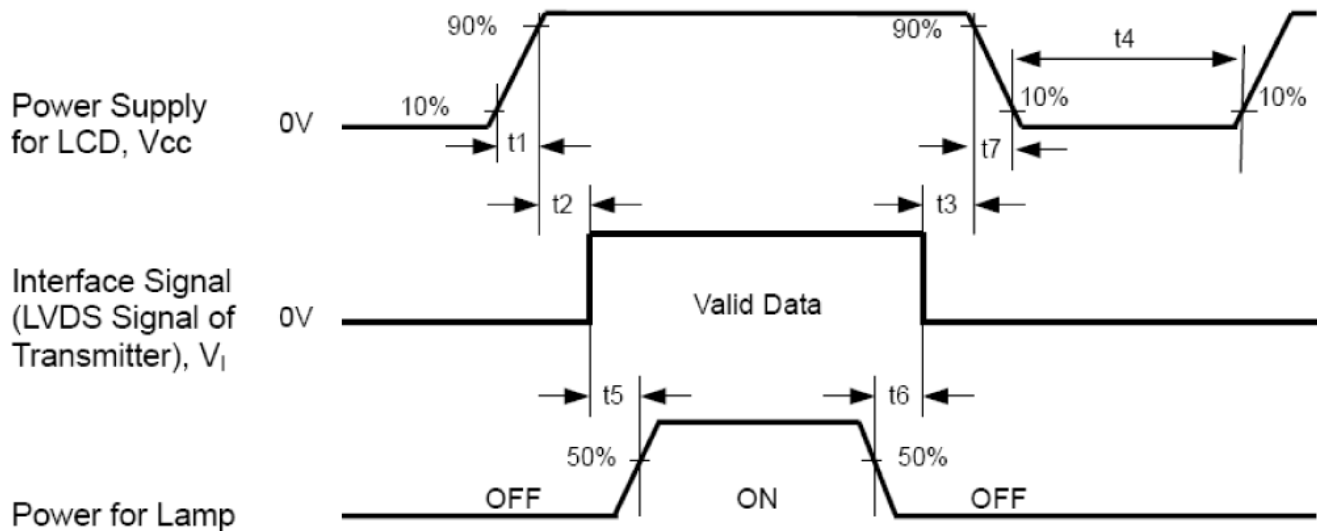


If $V_{TH} < V_{DD} \leq V_{min}$, then $t_d \leq 10\text{ms}$; When the voltage returns to normal our panel must revive automatically.

7. Timing Characteristics

7.1 Power ON/OFF sequence

VDD power on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



Parameter	Symbol	Unit	Min	Typ	Max
VDD Rise Time	T1	ms	0.5	-	10
VDD Good to Signal Valid	T2	ms	0	-	20
Signal Disable to Power Down	T3	ms	0	-	1000
Power off	T4	ms	100	-	
Signal Valid to Backlight On	T5	ms	300	-	
Backlight Off to Signal Disable	T6	ms	200	-	
VDD Fall Time	T7	ms	0	-	100

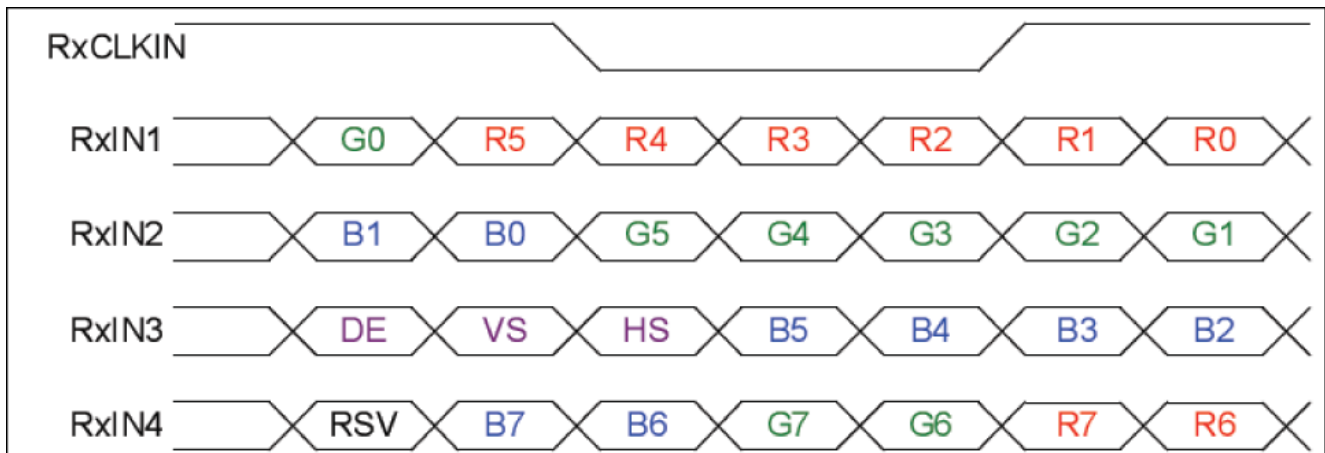
【Note】 H Blank area and V Blank area cannot be changed at every frame

7.2 Timing characteristics

7.2.1 AC Electrical Characteristics

Parameter	Symbol	Unit	Min	Typ	Max
LVDS Clock Frequency<single>	Fdck	MHz	50	65	80
H Total Time	Thp	clocks	1056	1344	1720
H Active Time	HA	clocks	1024	1024	1024
H Front Porch	Thfp	clocks	-	48	-
H Sync Pulse Width	HSPW	clocks	-	32	-
H Back Porch	Thbp	clocks	-	240	-
H Frequency	Fh	KHz	46.32	48.36	59.40
V Total Time	Tvp	lines	772	806	990
V Active Time	VA	lines	768	768	768
V Front Porch	Tvfp	lines	-	3	-
V Sync Pulse Width	VSPW	lines	-	12	-
V Back Porch	Tvbp	lines	-	23	-
V Frequency	fv	Hz	-	60	-

7.2.2 Timing Diagram of Interface Signal



【Note 1】 Follow SPWG

【Note 2】 R/G/B data7: MSB, R/G/B data0: LSB

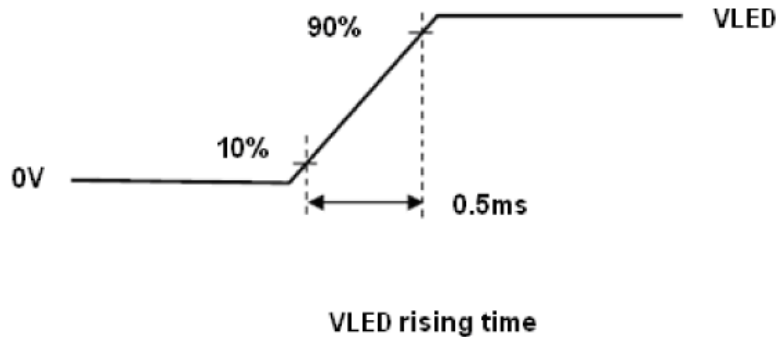
8. Backlight Characteristic

8.1 Parameter Guideline of LED Backlight

Symbol	Parameter	Min	Typ	Max	Units	Condition	
VLED	LED Input	10.8	12	12.6	V	Ta=25°C Note B	
PLED	LED Power Consumption	-	-	(7.5)	W	Ta=25°C Note B	
VLED_PWM	PWM Signal Voltage	High	4.5	5	5.5	V	Ta=25°C
		Low	-	-	0.8	V	
F _{PWM}	PWM dimming Frequency	200	-	20K	Hz	Ddim≥5%	
VLED_EN	LED Enable Voltage	High	2.0	5	5.5	V	-
		Low	-	-	0.8	V	
LT	LED Life Time	30,000	-	-	Hours	Ta=25°C Note A	

【Note A】 The LED life time define as the estimated time to 50% degradation of initial luminous.

【Note B】 A higher LED power supply voltage will result in better power efficiency. Keep the VLED between 12V and 12.6V is strongly recommended.



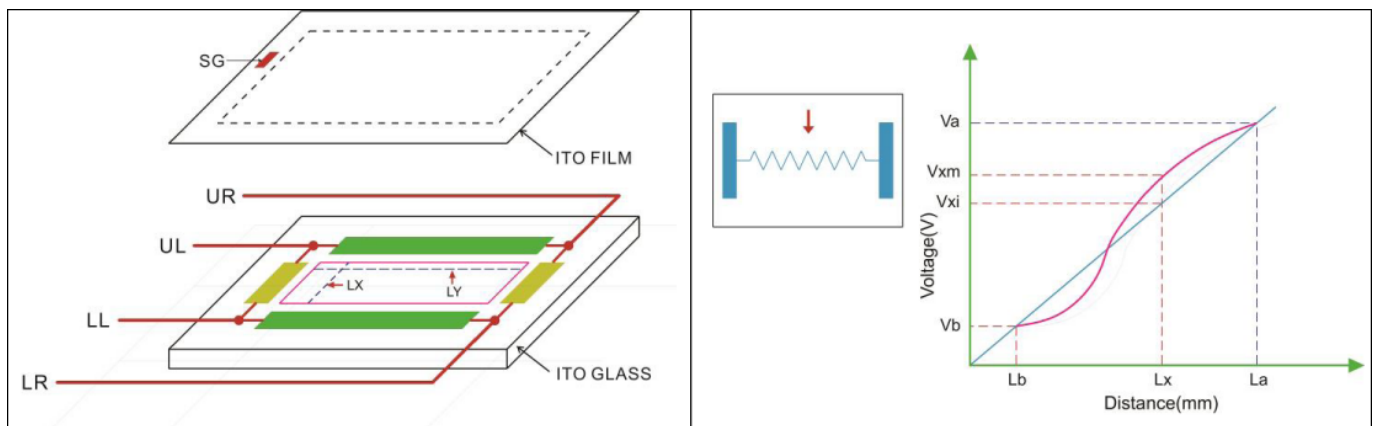
9. Touch Panel

9.1 Touch Panel Characteristics

Item	Specification
Style	Analog resistance
Dimension outline	326.0(W) x 252.0(H) x 2.2(T) mm
Operating Force	≤80g(R0.8 Touch Pen)
Surface Hardness	≥3H
Loop resistance	X : 20Ω~500Ω, Y : 20Ω~500Ω
Voltage endurance	DC 5V/60sec
Linearity deviation	X≤1.5%, Y≤1.5%
Insulation resistance	≥ 20 MΩ/25V DC
Chattering	≤ 10 ms
Operating Temperature Range	-10°C ~+60°C 20%, 80%RH
Storage Temperature Range	-20°C ~+70°C 20%, 90%RH
Knock test	10,000,000 times keystrokes

9.2 Linearity

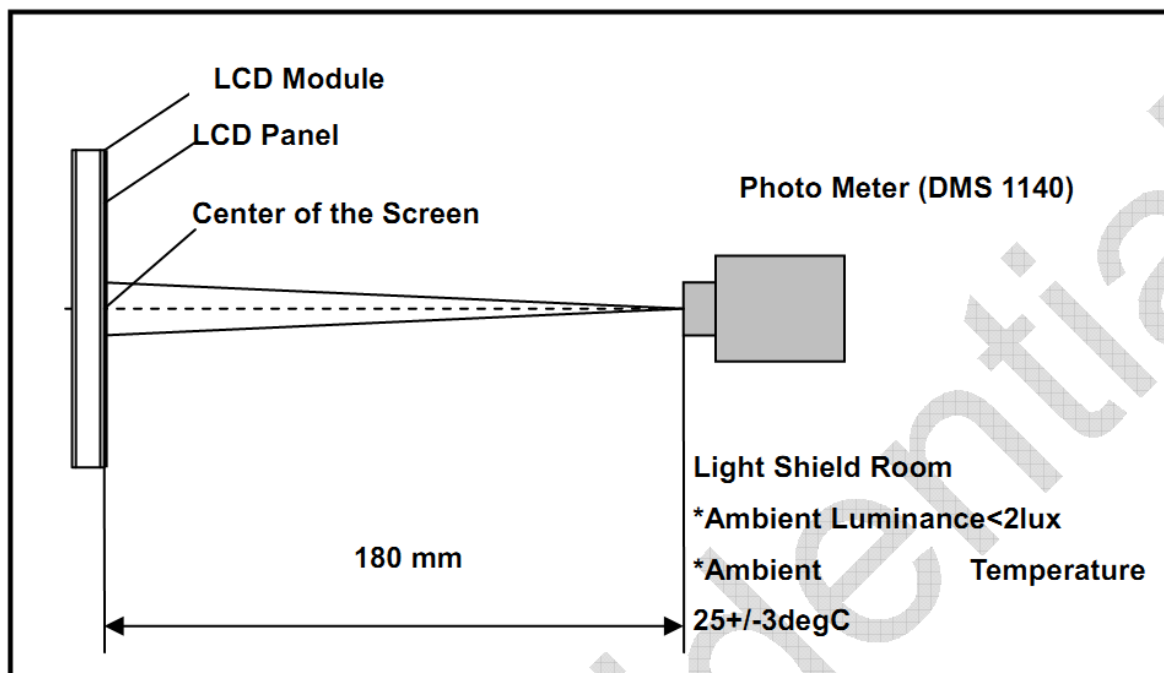
1. Short RT and RL (or short RL and LL)
2. Apply voltage DC 5V
3. Short LT and LL (or short RT and LT)
4. Apply grounding
5. Draw points along Lx and Ly at 5.0mm intervals within pattern area and detect the voltage at SG
6. Measure the voltage differences between RT and LT (or RT and RL)



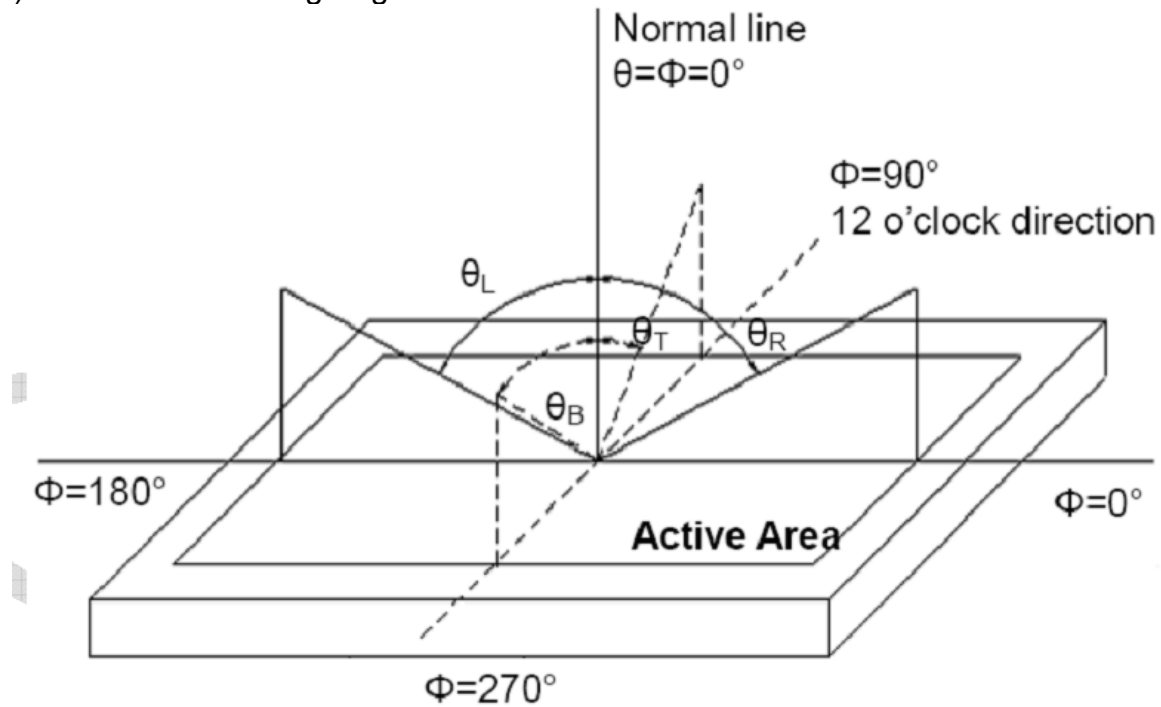
10. Optical Characteristics

Item	Conditions	Min.	Typ.	Max.	Unit	Note	
Viewing Angle (CR>10)	Horizontal	θ_L	70	80	-	degree	(1),(2),(6)
		θ_R	70	80	-		
	Vertical	θ_T	70	80	-		
		θ_B	60	80	-		
Contrast Ratio	Center	450	800	-	-	(1),(3),(6)	
LCM Luminance	Center point	250	320	-	Cd/m ²		
Response Time	Rising + Falling	-	16	-	ms	(1),(4),(6)	
CF Color Chromaticity (CIE1931)	Red x	Typ. -0.05	TBD	Typ. +0.05	-	(1), (6)	
	Red y		TBD		-		
	Green x		TBD		-		
	Green y		TBD		-		
	Blue x		TBD		-		
	Blue y		TBD		-		
	White x		0.305		-		
	White y		0.325		-		
NTSC	CIE1931	-	70	-	%	(1),(6)	
Luminance Uniformity	9 Points	70	80		%	(1),(6)	

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



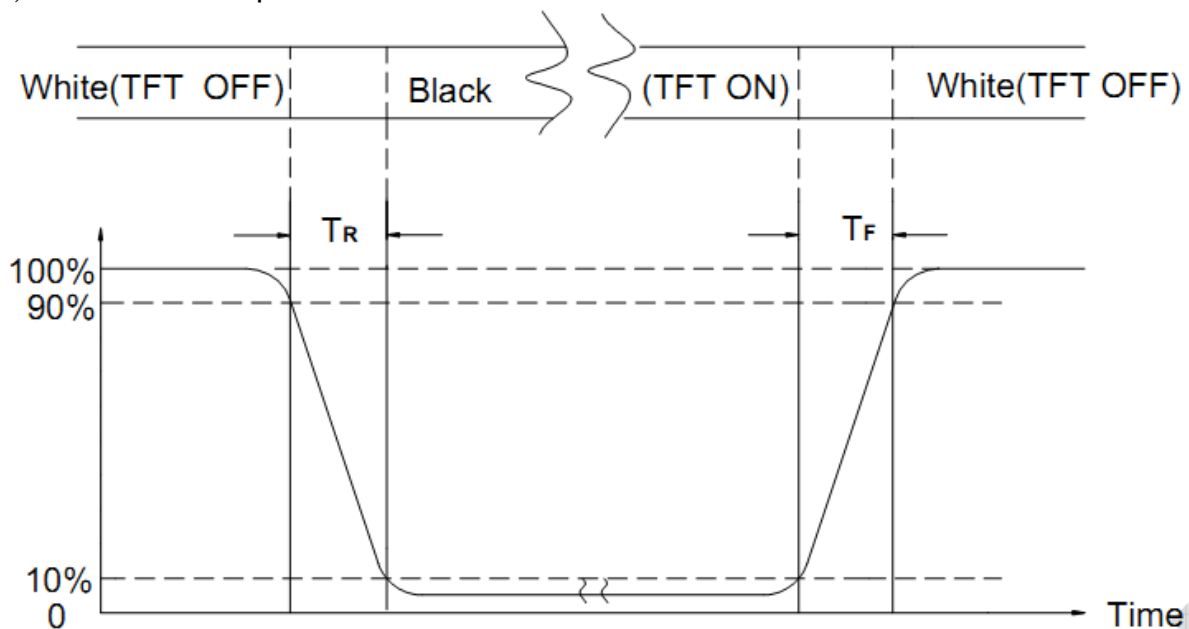
Note (3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

$$\text{Contrast Ratio (CR)} = L63 / L0$$

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

11. Reliability Test Conditions and Methods

NO.	TEST ITEMS	TEST CONDITION	INSPECTION AFTER TEST
<input type="checkbox"/>	High Temperature Storage	80°C±2°C×200Hours	Inspection after 2~4hours storage at room temperature, the samples should be free from defects: 1, Air bubble in the LCD. 2, Sealleak. 3, Non-display. 4, Missing segments. 5, Glass crack. 6, Current IDD is twice higher than initial value. 7, The surface shall be free from damage. 8, The electric characteristics requirements shall be satisfied.
<input type="checkbox"/>	Low Temperature Storage	-30°C±2°C×200Hours	
<input type="checkbox"/>	High Temperature Operating	70°C±2°C×120Hours	
<input type="checkbox"/>	Low Temperature Operating	-20°C±2°C×120Hours	
<input type="checkbox"/>	Temperature Cycle(Storage)	-20°C ↔ 25°C ↔ 70°C (30min) ← (5min) → (30min) 1cycle Total 10cycle	
<input type="checkbox"/>	Damp Proof Test (Storage)	50°C±5°C×90%RH×120Hours	
<input type="checkbox"/>	Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5M X,Y,Z direction for total 3hours (Packing Condition)	
<input type="checkbox"/>	Drooping Test	Drop to the ground from 1M height one time every side of carton. (Packing Condition)	
<input type="checkbox"/>	ESD Test	Voltage:±8KV,R:330Ω,C:150PF,Air Mode,10times	

REMARK:

- 1, The Test samples should be applied to only one test item.
- 2, Sample side for each test item is 5~10pcs.
- 3, For Damp Proof Test, Pure water(Resistance > 10MΩ)should be used.
- 4, In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.
- 5, EL evaluation should be accepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
- 6, Failure Judgment Criterion: Basic Specification Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

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 IOVCC or GND, 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