

Specification for Approval

Customer: _____

Model Name: _____

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

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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

ITEM	STANDARD VALUES	UNITS
LCD type	3.5" TFT	--
Dot arrangement	240(RGB) × 320	dots
Top Polarizer Type	Anti-Glare	--
Display mode	TFT/ Transflective	--
Viewing Direction	6 O'clock	--
Driver IC	ILI9341V	--
Module size	61.00(W) × 85.00(H) × 2.93(T)	mm
Active area	53.64(W) × 71.52(H)	mm
Dot pitch	0.2235(W) × 0.2235(H)	mm
Interface	SPI+18BIT RGB	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	6 White LED	--
Weight	TBD	g

3. External Dimensions

NOTES:

- 1.DISPLAY TYPE: 3.5" TFT
- 2.VIEWING DIRECTION: 6 O'CLOCK
- 3.LCD DRIVE IC: ILI9341V
- 4.POLARIZER MODE: TRANSFLECTIVE/POSITIVE
- 5.OPERATING TEMP.: -20° C~+70° C
- 6.STORAGE TEMP.: -30° C~+80° C
- 7.INTERFACE: SPI+18 bit RGB
- 8.SURFACE LUMINANCE: 150 cd/m2(TYP.)
- 9.UNMARKER TOLERANCE: ± 0.20
- 10.REQUIREMENTS ON ENVIRONMENTAL PROTECTION: ROHS

View Direction 6 o'clock

250Wx235H

LED CIRCUIT DIAGRAM
19.2V@20mA

Pixel Detail

NO.	DESCRIPTION OF REVISION	REASON	REVISED BY	DATE
1	first issue	0		2016/3/2

1	VL1	26	B1
2	GND	27	B0
3	VL2	28	ENAB
4	GND	29	GND
5	VSHD	30	HSYNC
6	GND	31	GND
7	GND	32	CLK
8	GND	33	GND
9	VSYNC	34	G5
10	GND	35	G4
11	RESET	36	G3
12	GND	37	G2
13	GND	38	G1
14	GND	39	G0
15	CS	40	GND
16	GND	41	R5
17	SDO	42	R4
18	SDI	43	R3
19	GND	44	R2
20	SCL	45	R1
21	GND	46	R0
22	B5	47	GND
23	B4	48	GND
24	B3	49	GND
25	B2	50	GND

子都上晴電子有限公司
YU DU AMSON ELECTRONICS Co., Ltd.

TITLE: OUTLINE DIMENSION
D/N: AM-240320-035D

Rev: 0

SCALE: 1 : 1

UNIT: mm

SHEET NO: 1 OF 1

4. Interface Description

PIN NO.	PIN NAME	DESCRIPTION
1	VL1	Anode of LED(High voltage)
2	GND	Power ground
3	VL2	Cathode of LED(Low voltage)
4	GND	Power ground
5	VSHD	Power supply for digital
6-8	GND	Power ground
9	VSYNC	Vertical sync. in RGB mode
10	GND	Power ground
11	RESET	Reset(Low active)
12-14	GND	Power ground
15	CS	Chip select input(Low enable)
16	GND	Power ground
17	SDO	Serial data output
18	SDI	Serial data input
19	GND	Power ground
20	SCL	Serial interface clock
21	GND	Power ground
22-27	B5~B0	Blue data bus
28	ENAB	Display enable pin from controller
29	GND	Power ground
30	HSYNC	Horizontal sync. in RGB mode
31	GND	Power ground
32	DCLK	Pixel clock signal in RGB mode
33	GND	Power ground
34-39	G5~G0	Green data bus
40	GND	Power ground
41-46	R5~R0	Red data bus
47-50	GND	Power ground

5. Absolute Maximum Ratings

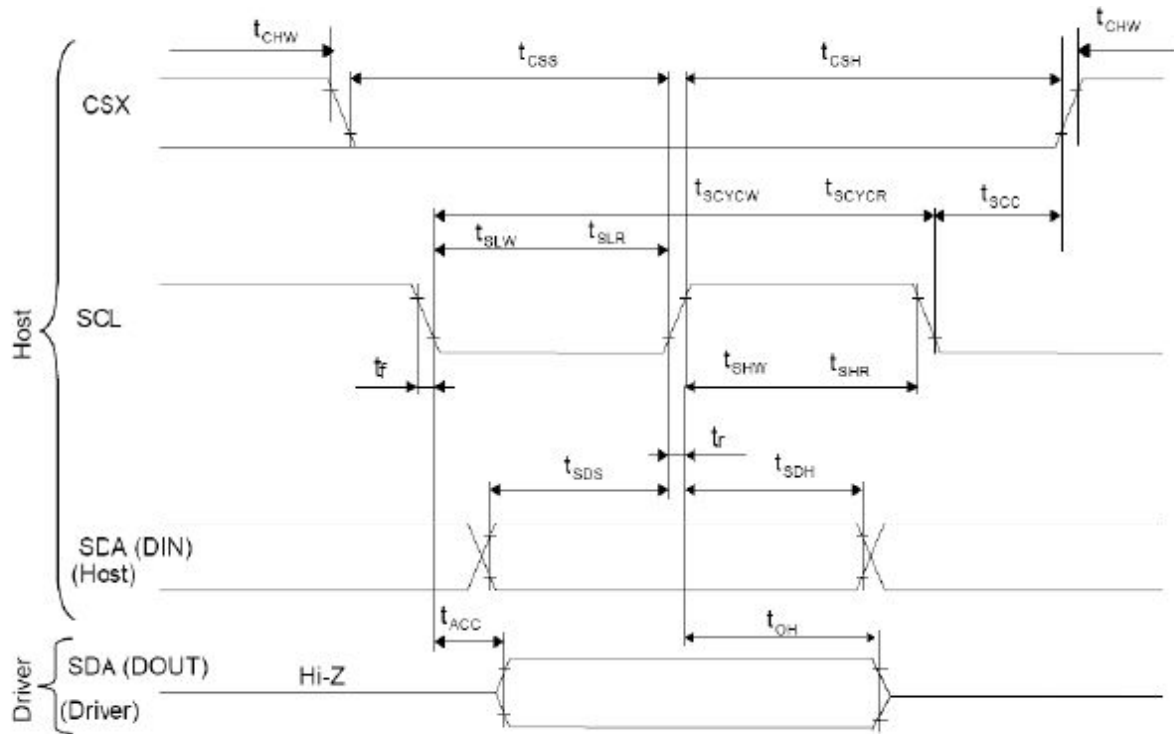
Item	Symbol	Min.	Max.	Unit
Logic Supply Voltage	VSHD	-0.3	4.5	V
Analog Supply Voltage	VSHD	-0.3	4.5	V
Supply current (One LED)	I _{LED}		30	mA
Operating Temperature	T _{OP}	-20	70	°C
Storage Temperature	T _{ST}	-30	80	°C
Storage Humidity	HD	20	90	%RH

6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Logic Supply Voltage	VSHD	3.0	3.3	3.6	V	-
Analog Supply Voltage	VSHD	3.0	3.3	3.6	V	-
Input High Voltage	V _{IH}	0.7 VSHD	-	VSHD	V	-
Input Low Voltage	V _{IL}	GND	-	0.3 VSHD	V	-
I/O Leak Current	I _{LI}	-1	-	1	uA	-

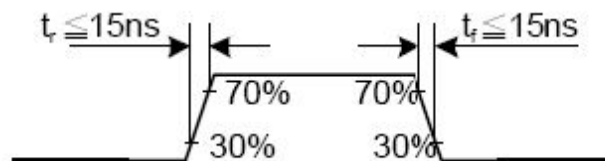
7. Timing Characteristics

7.1 3-WIRES SPI Timing Diagram

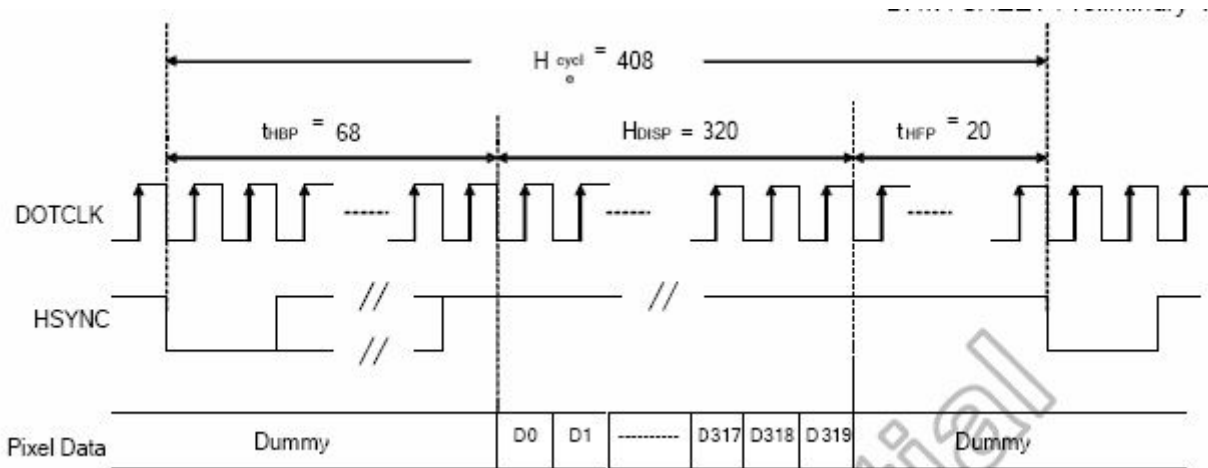


Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	100	-	ns	
	tshw	SCL "H" Pulse Width (Write)	40	-	ns	
	tslw	SCL "L" Pulse Width (Write)	40	-	ns	
	tscycr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	60	-	ns	
SDA / SDI (Input)	tsds	Data setup time (Write)	30	-	ns	
	tsdh	Data hold time (Write)	30	-	ns	
SDA / SDO (Output)	tacc	Access time (Read)	10	-	ns	
	toh	Output disable time (Read)	10	50	ns	
CSX	tsc	SCL-CSX	20	-	ns	
	tch	CSX "H" Pulse Width	40	-	ns	
	tcs	CSX-SCL Time	60	-	ns	
	tcs		65	-	ns	

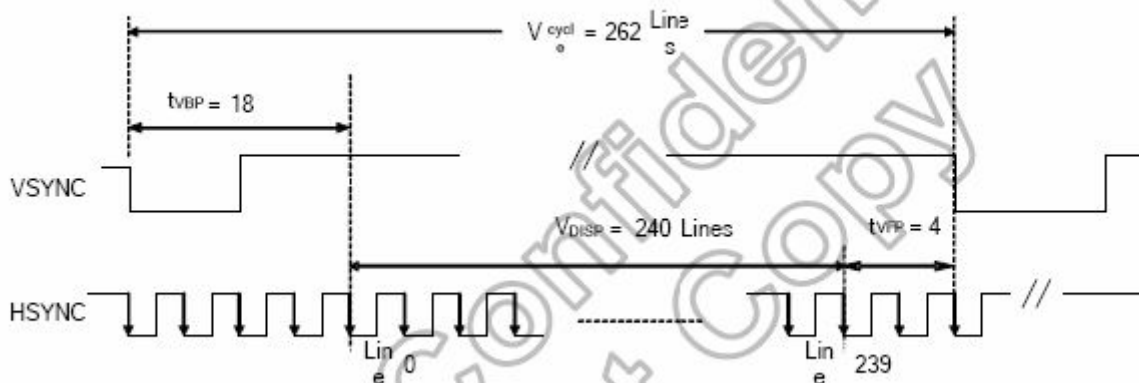
Note: $T_a = 25^\circ\text{C}$, $V_{DDI} = 1.65\text{V to } 3.3\text{V}$, $V_{CI} = 2.5\text{V to } 3.3\text{V}$, $AGND = VSS = 0\text{V}$



7.2 RGB Timing Diagram



(a) Horizontal Data Transaction Timing



(b) Vertical Data Transaction Timing

Characteristics	Symbol	Min.		Typ.		Max.		Unit
		24 bit	8 bit	24 bit	8 bit	24 bit	8 bit	
DOTCLK Frequency	f _{DOTCLK}	-	-	6.5	19.5	10	30	MHz
DOTCLK Period	t _{DOTCLK}	100	33.3	154	51.3	-	-	ns
Horizontal Frequency (Line)	f _H	-	-	14.9		22.35		KHz
Vertical Frequency (Refresh)	f _V	-	-	60		90		Hz
Horizontal Back Porch	t _{HBP}	-	-	68	204	-	-	t _{DOTCLK}
Horizontal Front Porch	t _{HFP}	-	-	20	60	-	-	t _{DOTCLK}
Horizontal Data Start Point	t _{HBP}	-	-	68	204	-	-	t _{DOTCLK}
Horizontal Blanking Period	t _{HBP} + t _{HFP}	-	-	88	264	-	-	t _{DOTCLK}
Horizontal Display Area	H _{DISP}	-	-	320	960	-	-	t _{DOTCLK}
Horizontal Cycle	H _{cycle}	-	-	408	1224	450	1350	t _{DOTCLK}
Vertical Back Porch	t _{VBP}	-	-	18		-	-	Lines
Vertical Front Porch	t _{VFP}	-	-	4		-	-	Lines
Vertical Data Start Point	t _{VBP}	-	-	18		-	-	Lines
Vertical Blanking Period	t _{VBP} + t _{VFP}	-	-	22		-	-	Lines
Vertical Display Area	NTSC	-		240		-		Lines
	PAL			280(PALM=0)				
	PAL			288(PALM=1)				
Vertical Cycle	NTSC	-		262		350		Lines
	PAL			313				

8. Backlight Characteristic

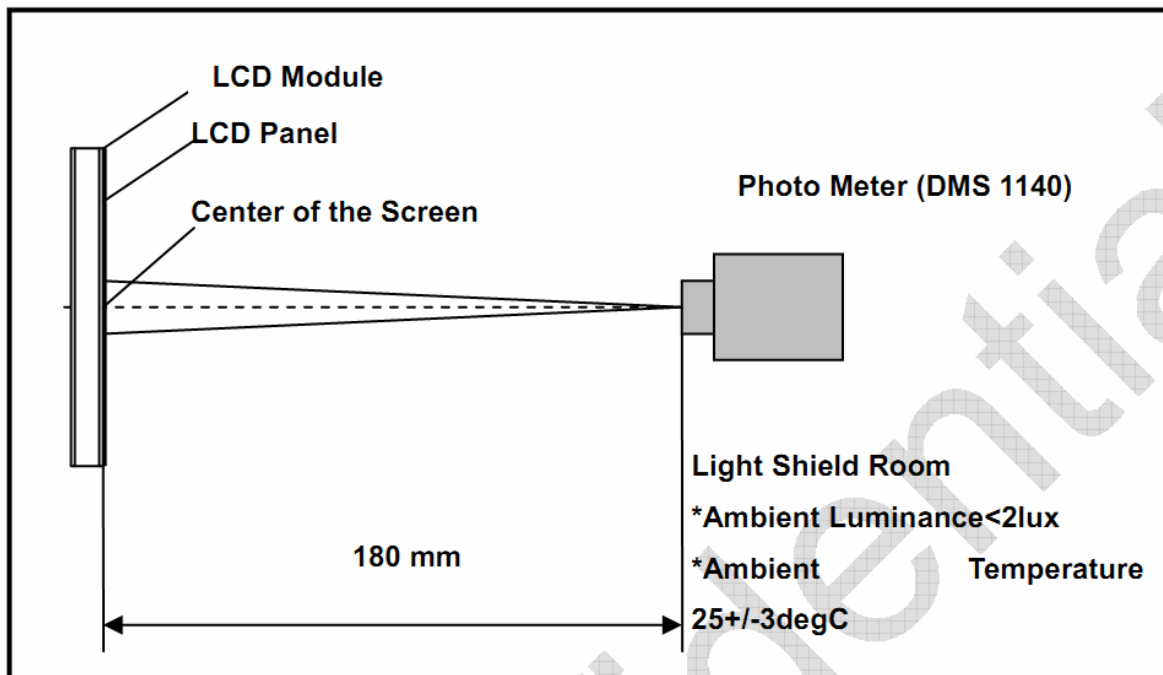


Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	-	19.2	-	V	If=20mA
Supply Current	If	-	20	30	mA	-
Luminous Intensity for LCM	-	-	150	-	Cd/m ²	If=20mA
Uniformity for LCM	-	80	-	-	%	If=20mA
Life Time	-	30000	50000	-	Hr	If=20mA
Backlight Color	White					

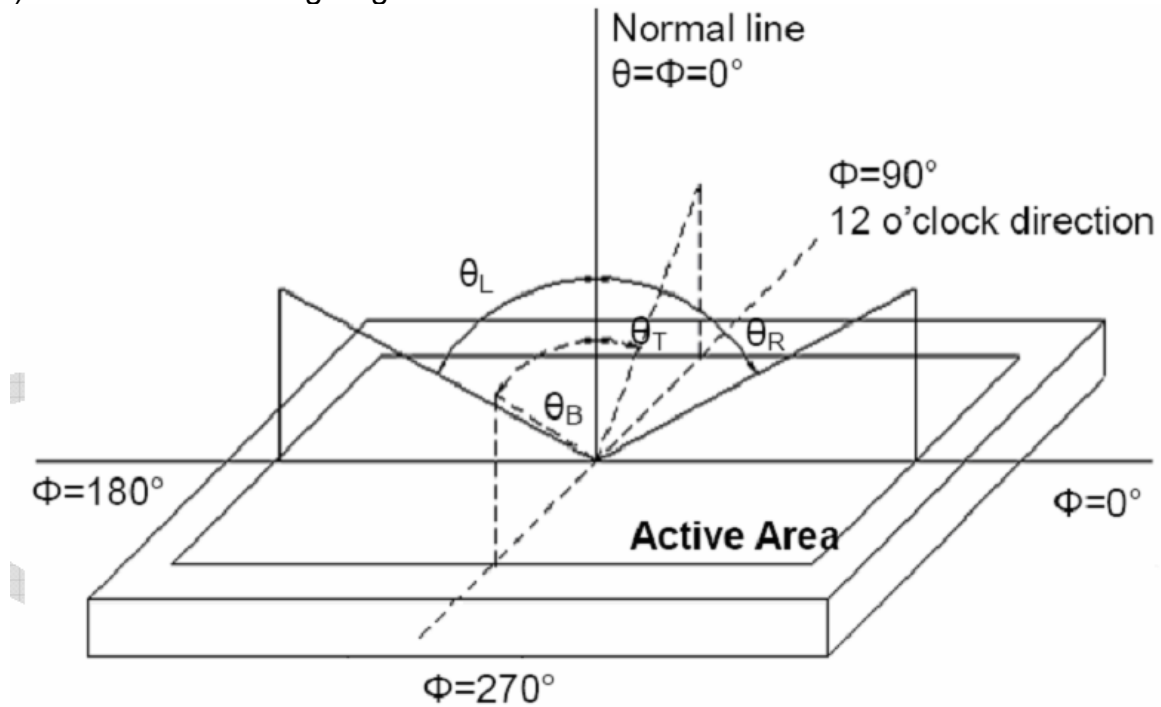
9. Optical Characteristics

Item	Conditions	Min.	Typ.	Max.	Unit	Note	
Viewing Angle (CR>10)	Horizontal	θ_L	-	40	-	degree	(1),(2),(6)
		θ_R	-	45	-		
	Vertical	θ_T	-	40	-		
		θ_B	-	55	-		
Contrast Ratio	Center	100	150	-	-	(1),(3),(6)	
Response Time	Rising	-	35	-	ms	(1),(4),(6)	
	Falling	-	35	-	ms	(1),(4),(6)	
CF Color Chromaticity (CIE1931)	Red x	-	-	-	-	(1), (6)	
	Red y	-	-	-	-		
	Green x	-	-	-	-		
	Green y	-	-	-	-		
	Blue x	-	-	-	-		
	Blue y	-	-	-	-		
	White x	-	0.31	-	-		
White y	-	0.32	-	-			
Transmittance		-	-	-	%	(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



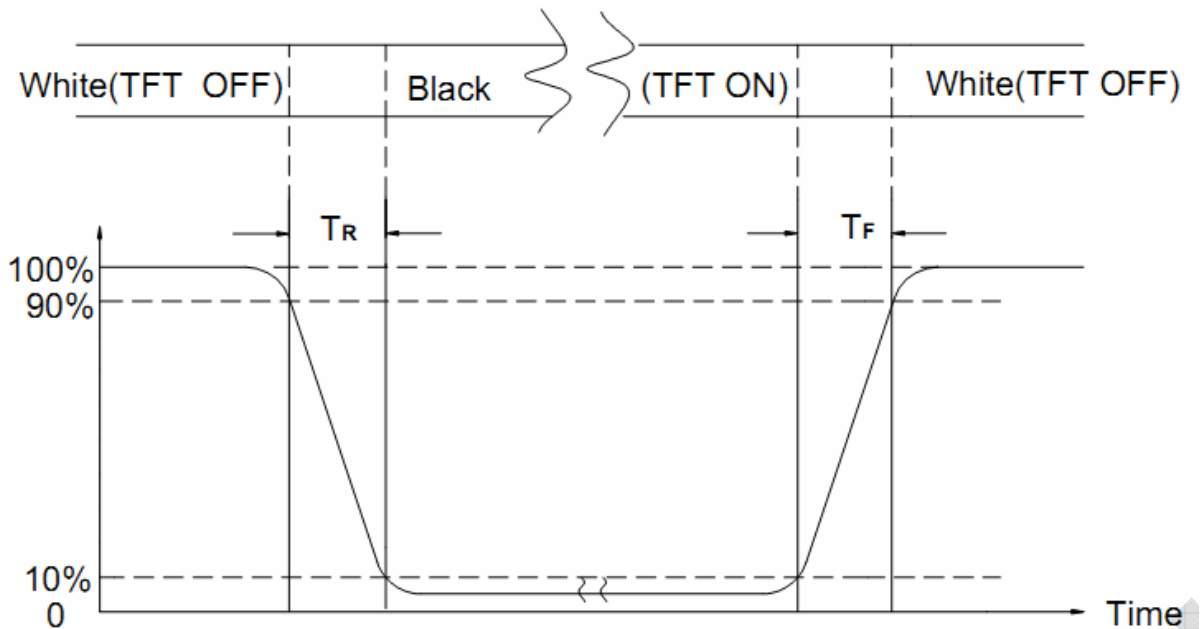
Note (3) Definition Of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

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

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	INSPECTION AFTER TEST
①	High Temperature Storage	80°C±2°C×120Hours	Inspection after 2~4hours storage at room temperature, the samples should be free from defects: 1, Air bubble in the LCD. 2, Seal leak. 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 characteristic requirements shall be satisfied.
②	Low Temperature Storage	-30°C±2°C×120Hours	
③	High Temperature Operating	70°C±2°C×120Hours	
④	Low Temperature Operating	-20°C±2°C×120Hours	
⑤	Temperature Cycle(Storage)	-20°C ↔ 25°C ↔ 70°C (30min) (5min) (30min) ← 1cycle → Total 10cycle	
⑥	Damp Proof Test (Storage)	50°C±5°C×90%RH×120Hours	
⑦	Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5M X,Y,Z direction for total 3hours (Packing Condition)	
⑧	Drooping Test	Drop to the ground from 1M height one time every side of carton. (Packing Condition)	
⑨	ESD Test	Voltage:±8KV,R:330Ω,C:150PF,Air Mode,10times	

REMARK:

- The Test samples should be applied to only one test item.
- Sample side for each test item is 5~10pcs.
- For Damp Proof Test, Pure water(Resistance > 10MΩ)should be used.
- 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.
- 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.
- Failure Judgment Criterion: Basic Specification Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

11. Handling Precautions

11.1 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.

11.2 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 silicicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

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

11.3 Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended 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.

11.4 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

11.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause 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 then the operating temperature range and on the other hand at higher temperature LCD's how 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.

11.6 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

11.7 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

12. Precaution for Use

12.1

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.

12.2

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.

13. Packing Method

TBD