Specification for Approval

Customer:_____

Model Name:_____

Supplier Approval			Customer approval
R&D Designed	R&D Approved	QC Approved	
Peter	*Peng Jun*		

Revision Record

REV NO.	REV DATE	CONTENTS	Note
A	2018-12-21	NEW ISSUE	
B	2019-11-19	Modify the luminance and drawing	

Table of Contents

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
Color filter array	RGB vertical stripe	-
Display mode	TN / Transflective / Normally White	-
Gray Scale Inversion Direction	12 O'clock	--
Eyes Viewing Direction	6 O'clock	--
Driver IC	ILI9341V	-
Module size	64.00(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 + 18-bit RGB interface	-
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	6 White LED In Serial	-

3. External Dimensions

NOTES:
1. General Tolerance: ±0.2
2. ( )reference dimension.
3. Recommended Case Open Area Should Be Less Than Module V.A
4. recommended cushion adherent area:IP V.A+1.6mm
5. ROHS MUST BE COMPLIANT

Pixtel Detail

LED CIRCUIT DIAGRAM
19.2V 20mA

Display Type	TFT
Optimum Viewing Direction	6 O'CLOCK
Upper Plaarizer Type	Glare
LCD Driver IC	ILI9341V
Operating Voltage	VDD=3.3V
Operation Temperature	-20℃ TO 70℃
Storage Temperature	-30℃ TO 80℃
Interface	SPI+18 bit RGB
Backlight	6-CHIP WHITE LED
Surface luminance	130 cd/m² TYP.
White X/Y	---

TITLE: OUTLINE DIMENSION

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

DRAWN BY:
CHECKED BY:
APPROVED BY:

D/N:AM240320-035F
Rev:B
SCALE: 1:1
SHEET NO: 1 OF 1
UNIT: mm

SMY.	DESCRIPTION OF REVISION	REASON	REVISED BY	DATE
⚠	first issue	A	XG,SU	2018/12/21
⚠	Modify the luminance and drawing	B	XG,SU	2019/11/19

4. Interface Description

PIN NO.	PIN NAME	DESCRIPTION
1	LEDA	LED backlight anode.
2	VSS	Power ground.
3	LEDK	LED backlight cathode.
4	VSS	Power ground.
5	VDD	Power Supply Voltage
6~8	VSS	Power ground.
9	VSYNC	Frame synchronizing signal for RGB interface operation.
10	VSS	Power ground.
11	RESET	Reset signal input terminal, active at 'L'.
12~14	VSS	Power ground.
15	/CS	Chip select input (Low enable).
16	VSS	Power ground.
17	SDO	Serial data output
18	SDA	Serial data input
19	VSS	Power ground.
20	SCL	Synchronizing clock signal in SPI mode.
21	VSS	Power ground.
22~27	B5~B0	Blue data input.
28	DE	Data DE signal for RGB interface operation.
29	VSS	Power ground.
30	HSYNC	Line synchronizing signal for RGB interface operation.
31	VSS	Power ground.
32	DCLK	Dot clock signal for RGB interface operation.
33	VSS	Power ground.
34~39	G5~G0	Green data input.
40	VSS	Power ground.
41~46	R5~R0	Red data input.
47~50	VSS	Power ground.

5. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Power Supply Voltage	VDD	-0.3	4.5	V
Input Voltage	Vin	0	VDD+0.3	V
Operating Temperature	T_{OP}	-20	70	°C
Storage Temperature	T_{ST}	-30	80	°C
Storage Humidity	HD	-	90	%RH

6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply Voltage	VDD	3.0	3.3	3.6	V	-
Input High Voltage	V_{IH}	0.7VDD	-	VDD	V	Digital input pins
Input Low Voltage	V_{IL}	VSS	-	0.3VDD	V	Digital input pins
Output High Voltage	V_{OH}	0.8VDD	-	VDD	V	Digital output pins
Output Low Voltage	V_{OL}	VSS	-	0.2VDD	V	Digital output pins
I/O Leak Current	I_{LI}	-1	-	1	uA	-

7. Timing Characteristics

7.1 3-wires SPI Timing Characteristics
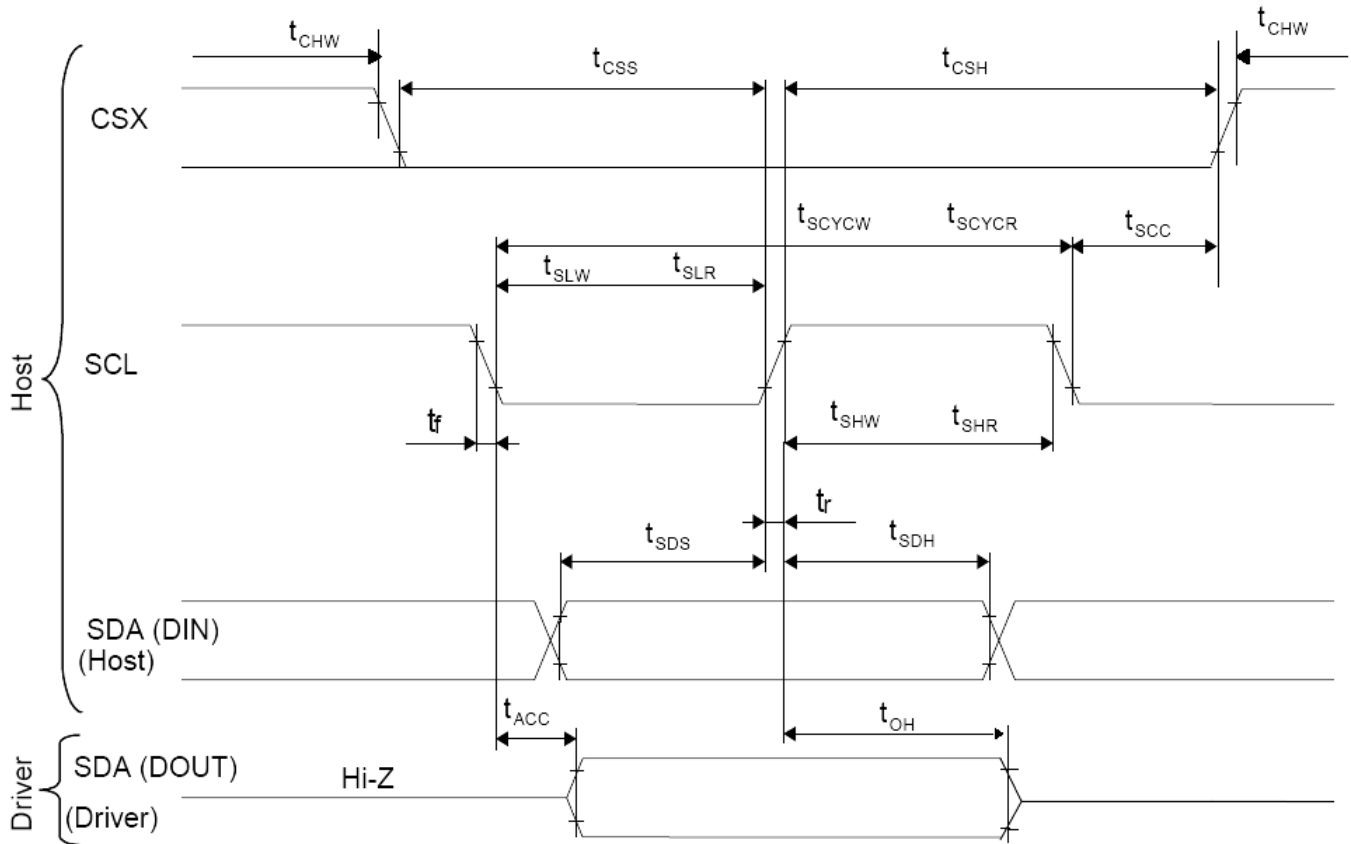
Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	100	-	ns	
	tshw	SCL "H" Pulse Width (Write)	40	-	ns	
	tslw	SCL "L" Pulse Width (Write)	40	-	ns	
	tscycr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	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	tscc	SCL-CSX	20	-	ns	
	tchw	CSX "H" Pulse Width	40	-	ns	
	tcss	CSX-SCL Time	60	-	ns	
	tcsh		65	-	ns	

Note: Ta = 25 ℃, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, AGND=VSS=0V
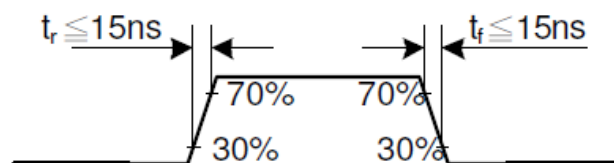
7.2 RGB Interface Timing Characteristics

VLW : VSYNC Low Width
HLW : HSYNC Low Width
DTST : Data Transfer Startup Time
P : Pixel : N=240X320=76800
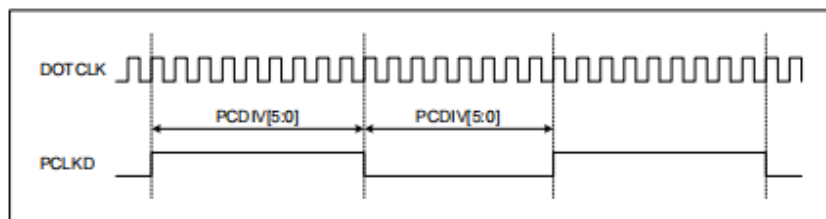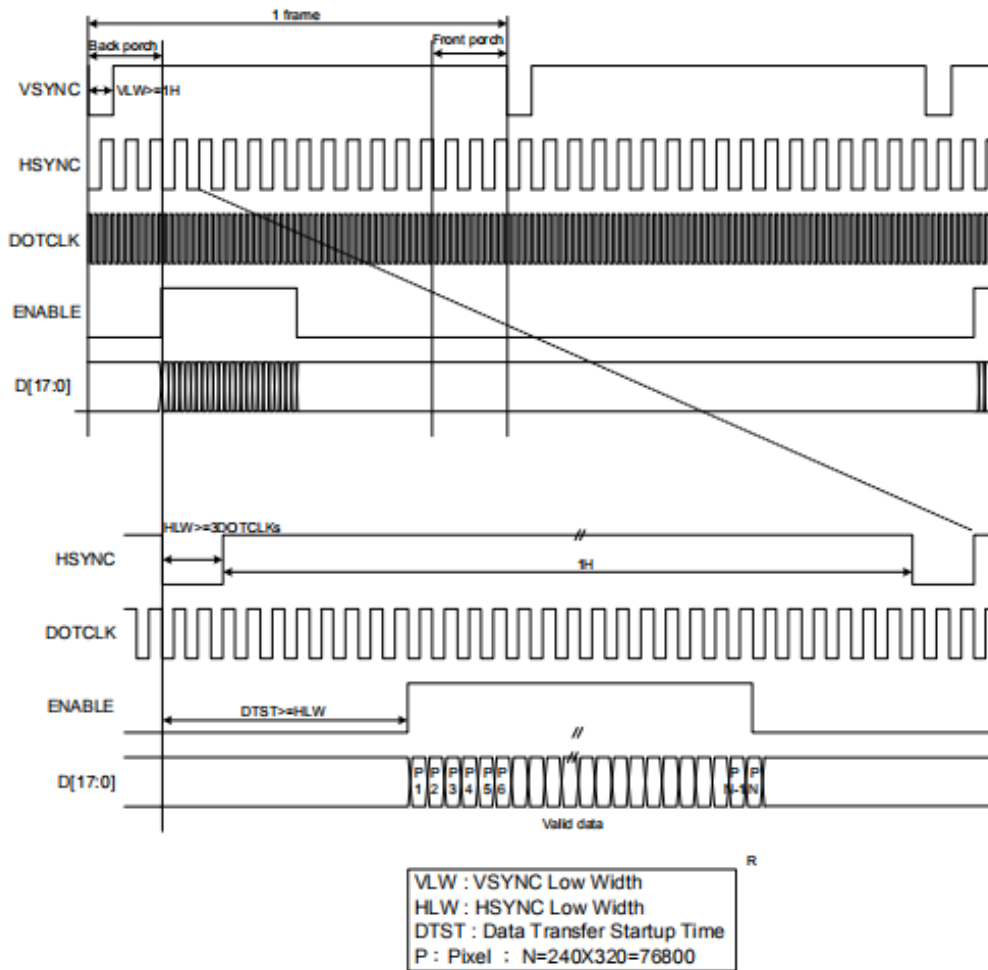
Note 1: The DE signal is not needed when RGB interface SYNC mode is selected.

Note 2: VSPL='0', HSPL='0', DPL='0' and EPL='0' of "Interface Mode Control (B0h)" command.

Parameters	Symbols	Condition	Min.	Typ.	Max.	Units
Horizontal Synchronization	Hsync		2	10	16	DOTCLK
Horizontal Back Porch	HBP		2	20	24	DOTCLK
Horizontal Address	HAdr		-	240	-	DOTCLK
Horizontal Front Porch	HFP		2	10	16	DOTCLK
Vertical Synchronization	Vsync		1	2	4	Line
Vertical Back Porch	VBP		1	2	-	Line
Vertical Address	VAdr		-	320	-	Line
Vertical Front Porch	VFP		3	4	-	Line

Typical values are setting example when used with panel resolution 240 x 320 (QVGA), clock frequency 6.35MHz and frame

8. Backlight Characteristics

BL Circuit Diagram:

LEDA ———▸|—— ▸|—— ▸|—— ▸|—— ▸|—— ▸|—— LEDK
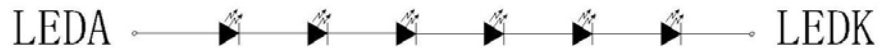
Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	16.8	19.2	20.4	V	If=20mA
Supply Current	If	-	20	30	mA	-
Luminous Intensity for LCM	-	110	130	150	Cd/m^2	If=20mA
Life Time	-	30000	50000	-	Hr	If=20mA
Backlight Color	White					

9. Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θL	-	60	-	degree	(1),(2),(6)
		θR	-	60	-		
	Vertical	θT	-	55	-		
		θB	-	60	-		
Contrast Ratio	Center		100	150	-	-	(1),(3),(6)
Response Time	Rising + Falling		-	35	-	ms	(1),(4),(6)
CF Color Chromaticity (CIE1931)	Red x		Typ. -0.05	0.507	Typ. +0.05	-	(1), (6)
	Red y			0.327		-	
	Green x			0.334		-	
	Green y			0.529		-	
	Blue x			0.157		-	
	Blue y			0.143		-	
	White x			0.324		-	
	White y			0.372		-	
Uniformity	Un		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.
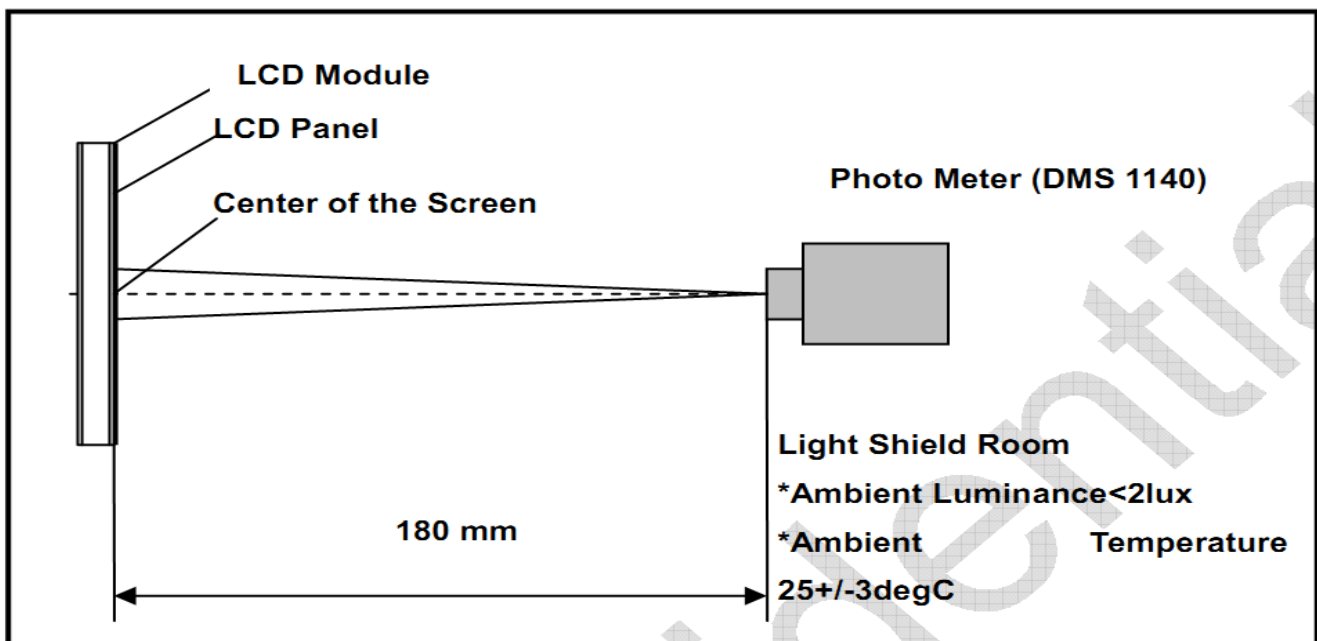
Note (2) Definition of Viewing Angle
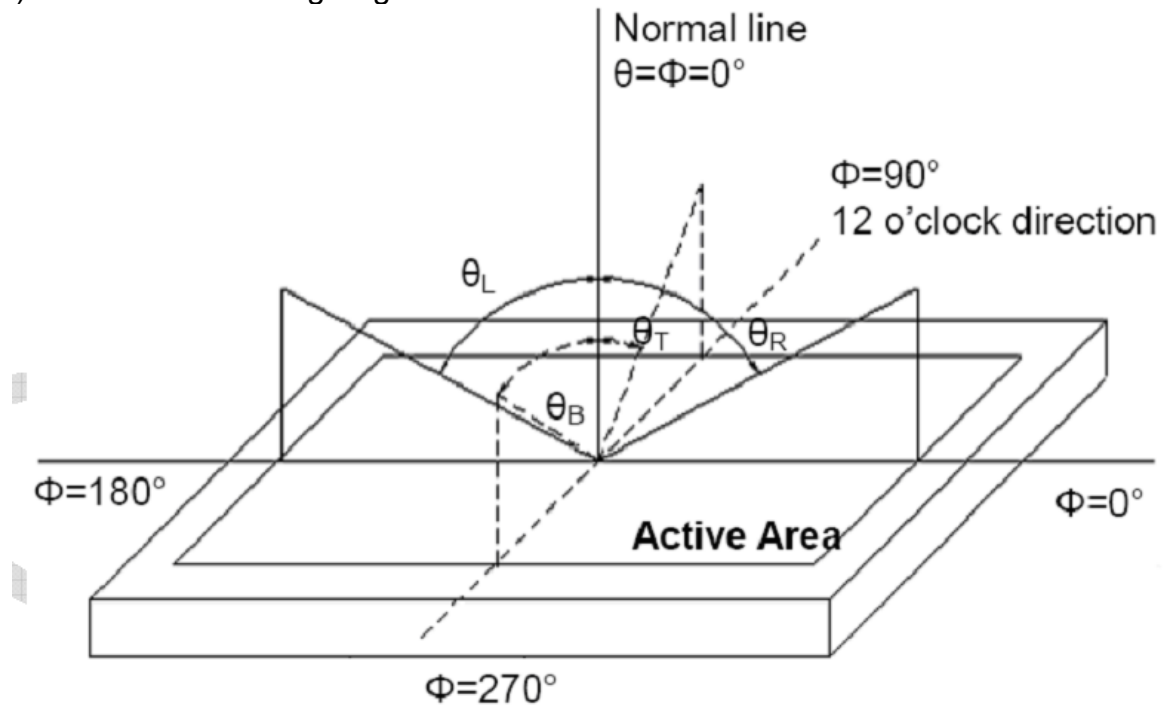
Note (3) Definition Of Contrast Ratio (CR)

    The contrast ratio can be calculated by the following expression

    Contrast Ratio (CR) = L63 / L0

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

Note (4) Definition of response time
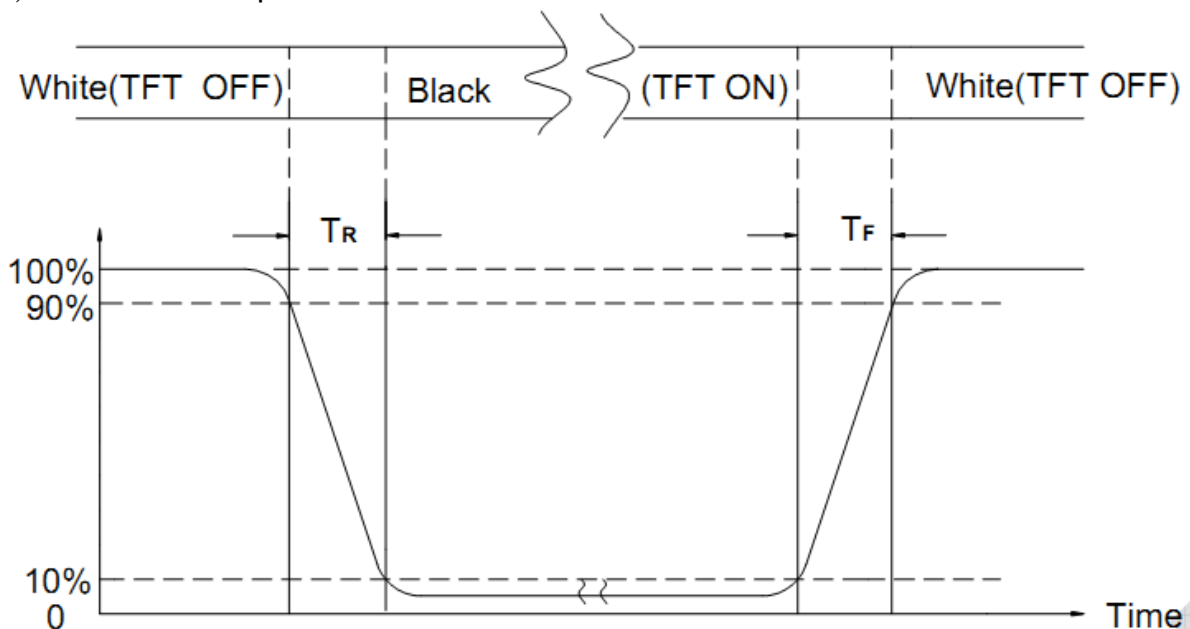
Note (5) Definition of Transmittance (Module is without signal input)

    Transmittance = Center Luminance of LCD / Center Luminance of Back Light x 100%

Note (6) Definition of color chromaticity (CIE1931)

    Color coordinates measured at the center point of LCD

10. Reliability Test Conditions and Methods
10.1 Standard Specification for Reliability of LCD Module

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70℃, 240 hours	IEC60068-21:2007 GB2423.2-2008
2	Low Temperature Operation	Ta = -20℃, 240 hours	IEC60068-2-1:2007 GB/2423.1-2008
3	High Temperature Storage	Ta = +80℃, 240 hours	IEC60068-21:2007 GB/2423.2-2008
4	Low Temperature Storage	Ta = -30℃, 240 hours	IEC60068-21:2007 GB/2423.1-2008
5	Storage at High Temperature and Humidity	Ta = +60℃, 90% RH max,240hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ 30 min~+80℃ 30 min, Change time:5min, 20 Cycle	Start with cold temperature, End with high temperature, IEC60068-214:1984, GB/2423.22-2002
7	ESD	C=150pF,R=330Ω,5point/ panel Air:±8Kv,5times; Contact:±4Kv,5times (Environment:15℃~35℃, 30%~60%.86Kpa~106 Kpa)	IEC61000-42:2001 GB/T17626.2-2006
8	Vibration Test	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z (6 hours for total)	IEC60068-2-6:1982 GB/T2423.101995
9	Mechanical Shock (NonOp)	Half Sine Wave60G 6ms, ±X,±Y,±Z 3times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height:80cm, 1corner,3 edges,6 surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

Note1: Ts is the temperature of panel's surface.
Note2: Ta is the ambient temperature of sample.

10.2 Testing Conditions and Inspection Criteria

For the final test, the testing sample must be stored at room temperature for 24 hours. After the tests listed in Table 9.2, standard specifications for reliability will be executed in order to ensure stability.

No.	Item	Test Model	In section Criteria
01	Current Consumption	Refer To Specification	The current consumption should conform to the product specification.
02	Contrast	Refer To Specification	After the tests have been executed, the contrast must be larger than half of its initial value prior to the tests.
03	Appearance	Visual inspection	Defect free.

10.3 MTBF

MTBF	Functions, performance, appearance, etc. shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature (25±5℃), normal humidity (50±10% RH), and in area not exposed to direct sun light.

11. Inspection Standard

This standard of Quality Assurance confirms to the quality of LCD module products supplied by Tecenstar.

11.1 Quality Test

Before delivering, the supplier should conduct the following tests to confirm the quality of products.

- Electrical-Optical Characteristics: According to the individual specification to test the product.
- Appearance Characteristics: According to the individual specification to test the product.
- Reliability Characteristics: According to the definition of reliability on the specification for testing products.

11.2 Delivery Test

Before delivering, the supplier should conduct the delivery test.

- Test method: According to MIL-STD105E.General Inspection Level Ⅱ take a single Time.
- The defects classify of AQL as following:
   Major defect: AQL = 0.65
   Minor defect: AQL = 1.5
   Total defects: AQL = 1.5

11.3 Non-conforming Analysis & Deal With Manners

- Purchaser should provide the data detail of non-conforming sample and the non-conforming.
- After receiving the data detail from purchaser, the analysis of non-conforming should be finished within two weeks.
- If the analysis can't be finished on time, supplier must notice purchaser 3 days in advance.

11.3.2 Disposition of non-conforming

- If any product defect be found during assembling, supplier must change the good for every defect after confirmation.
- Both supplier and customer should analyze the reason and discuss the disposition of non-conforming when the reason of nonconforming is not sure.

11.4 Agreement items

Both parties should negotiate together when the following problems happen.

- There is any problem of standard of quality assurance, and both sides should agree that it must be modified.
- There is any argument item which does not record in the standard of quality assurance.
- Any other special problem.

11.5 Standard of The Product Appearance Test
11.5.1 Manner of appearance test

- The test must be under 20W × 2 or 40W fluorescent light, and the distance of view must be at 30±5cm.
- When test the model of transmissive product must add the reflective plate.
- The test direction is base on around 10° of vertical line.
- Temperature: 25±5℃ Humidity: 60±10%RH

● Definition of area:
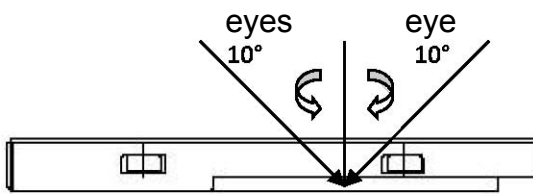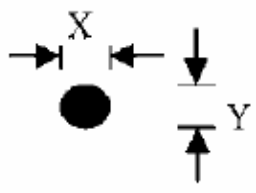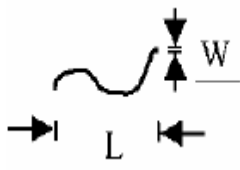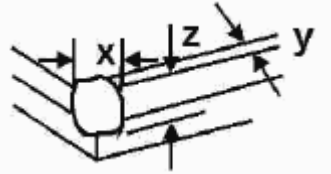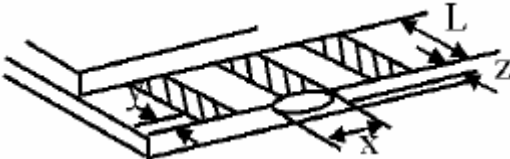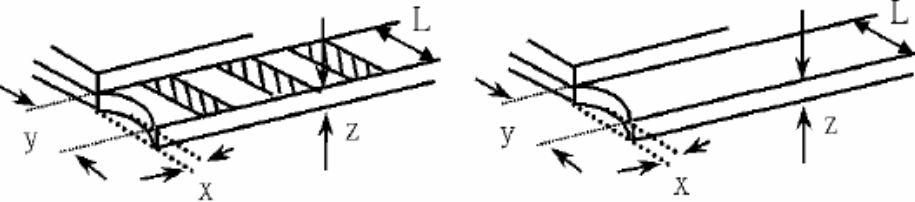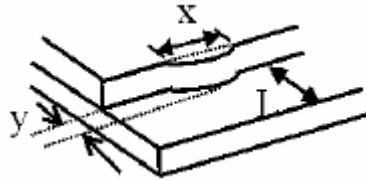

A:Viewing area B: Outside viewing area
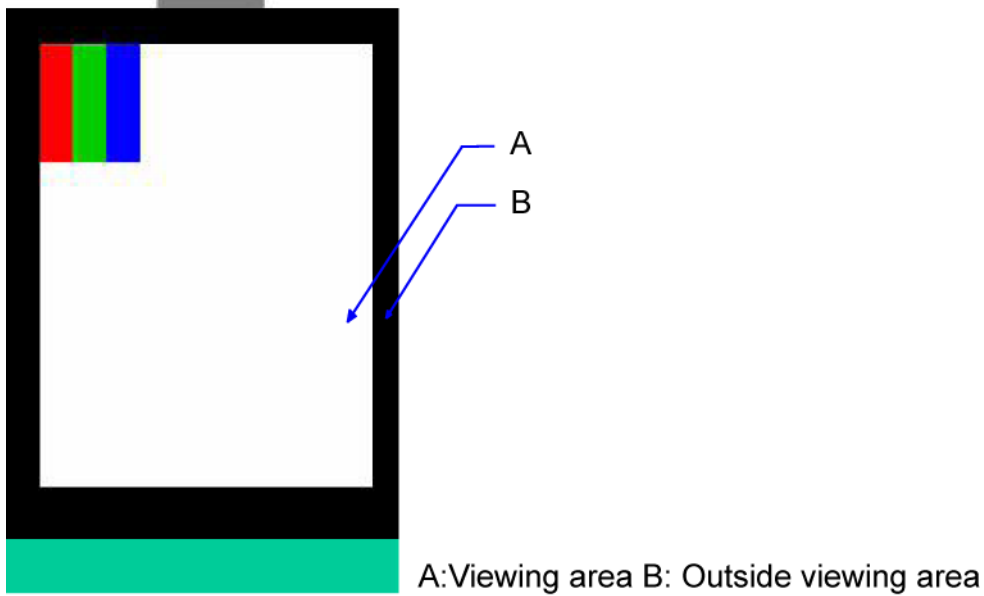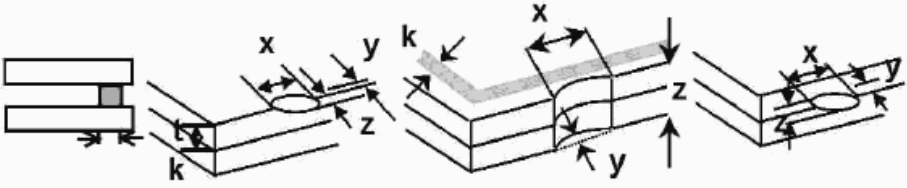
11.5.2 Basic principle

● When the standard can not be described, AQL will be applied.
● The sample of the lowest acceptable quality level must be negotiated by both supplier and customer when any dispute happened.
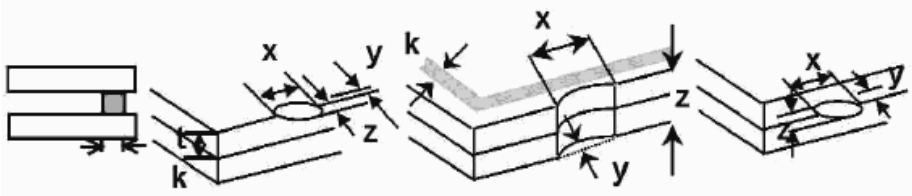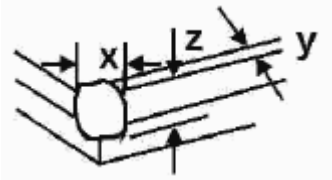● New item must be added on time when it is necessary.

11.6 Inspection Specification

NO.	Item	Criterion	AQL
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. 1.8 Flicker	0.65
02	Black or White spots or Bright spots or Color spots on LCD (Display only)	2.1 White and black or color spots on display $\leqq$ 0.25mm, no more than Five spots. 2.2 Densely spaced: No more than three spots within 3mm.	1.5
03	LCD and Touch Panel black spots, white spots, contamination (non – display)	3.1 Round type: As following drawing $\Phi = (X+Y) / 2$	1.5

3.1 Round type table:

Size(mm)	Acceptable Q'ty
$\Phi \leqq 0.10$	Accept no dense
$0.10 < \Phi \leqq 0.20$	1
$0.20 < \Phi \leqq 0.25$	1
$0.25 < \Phi \leqq 0.30$	0
$0.30 < \Phi$	0

* Densely spaced: No more than two spots within 3mm.

3.2 Line type: (As following drawing)

Length (mm)	Width(mm)	Acceptable Q'ty
---	$W \leqq 0.02$	Accept no dense
L<2.5	W<0.08	1
---	$0.08 \leqq W$	Rejection

* Densely spaced: No more than two lines within 3mm.

NO.	Item	Criterion			AQL
04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction	Size Φ(mm)	Acceptable Q'ty	1.5
			Φ≦0.30	Accept no dense	
			0.30< Φ≦0.50	0	
			0.50< Φ≦1.00	0	
			1.00< Φ	0	
			Total Q'ty	0	
05	Scratches	Follow NO.3 -2 Line Type.			
06	Chipped glass	Symbols: x: Chip length　　y: Chip width　　z: Chip thickness k: Seal width　　t: Glass thickness　a: LCD side length L: Electrode pad length 6.1 General glass chip: 6.1.1 Chip on panel surface and crack between panels: ⊙ Unit:　　mm ⊙ If there are 2 or more chips, x is the total length of each chip 6.1.2 Corner crack: ⊙ Unit:　　mm ⊙ If there are 2 or more chips, x is the total length of each chip			1.5

Table for 6.1.1:

z: Chip thickness	y: Chip width	x: Chip length
Z≦1/2t	Not over viewing area	x≦2MM
1/2t< z≦2t	Not exceed 1/3k	x≦2MM

Table for 6.1.2:

z: Chip thickness	y: Chip width	x: Chip length
Z≦1/2t	Not over viewing area	x≦2MM
1/2t< z≦2t	Not exceed 1/3k	x≦2MM

NO.	Item	Criterion	AQL
07	Glass crack	Symbols: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length 7.2 Protrusion over terminal: 7.2.1 Chip on electrode pad: (diagram) <table><tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr><tr><td>y≦0.5mm</td><td>x≦2MM</td><td>0< z≦t</td></tr></table> 7.2.2 Non-conductive portion: (diagram) <table><tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr><tr><td>y≦L</td><td>x≦2MM</td><td>0< z≦t</td></tr></table> ⊙ If there chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications. ⊙ If the product will be heat sealed by the customer, the alignment mark must mot be damaged. 7.2.3 Substrate protuberance and internal crack (diagram) <table><tr><td>y: width</td><td>x: length</td></tr><tr><td>y≦1/3L</td><td>X≦2MM</td></tr></table>	1.5

NO.	Item	Criterion	AQL
08	Cracked glass	No crack is allowed.	1.5
09	Backlight elements	9.1 Illumination source flickers when lit. 9.2 Spots or scratches that appear when lit must be judged. Using LCD spot, lines and contamination standards. 9.3 Backlight doesn't light or color is wrong.	1.5 1.5 0.65
10	Bezel	No scratches with W>0.1 and Length>2.5mm.	1.5
11	PCB、COB	11.1 COB seal may not have pinholes larger than 0.2mm or contamination. 11.2 COB seal surface may not have pinholes through to the IC. 11.3 The height of the COB should not exceed the height indicated in the assembly diagram. 11.4 There may not be more than 2mm of sealant outside the seal area on PCB. And there should be no more than three places. 11.5 Parts on PCB must be the same as on the production characteristic chart, There should be no wrong parts, missing parts or excess parts. 11.6 The jumper on the PCB should conform to the product characteristic chart.	1.5 1.5 1.5 1.5 0.65 0.65
12	FPC	FPC damage per IPC guidelines.(IPC-A-610) Nicks or damage along the edges of the flexible printed cir-cuitry and cutouts,providing the penetration does not exceed 50% of the distance from the edge to the nearest conductor to 2.5mm[0.1in], Whichever is less.	1.5
13	Soldering	13.1 No cold solder joints, missing solder connections, oxidation or icicle. 13.2 No short circuits in components on PCB or FPC. 13.3 Soldering per IPC guidelines.(IPC-A-610)	1.5 0.65

NO.	Item	Criterion	AQL
14	Touch Panel Chipped glass	Symbols: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Touch Panel Total thickness a: LCD side length L: Electrode pad length 14.1 General glass chip: 14.1.1 Chip on panel surface and crack between panels: <table><tr><td>z: Chip thickness</td><td>y: Chip width</td><td>x: Chip length</td></tr><tr><td>Z≦t</td><td>≦1/2 k and not over viewing area</td><td>x≦2MM</td></tr></table> ⊙ Unit: mm ⊙ If there are 2 or more chips, x is the total length of each chip 14.1.2 Corner crack: <table><tr><td>z: Chip thickness</td><td>y: Chip width</td><td>x: Chip length</td></tr><tr><td>z≦t</td><td>≦1/2 k and not over viewing area</td><td>x≦2MM</td></tr></table> ⊙ Unit: mm ⊙ If there are 2 or more chips, x is the total length of each chip	2.5

12. Handling Precautions

12.1 Mounting method

The LCD panel of AMSON TFT module consists of two thin glass plates with polarizes which easily be damaged. And since the module in 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 (CI) , Sulfur (S)

If goods were sent without being sili8con 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 (CI), Sulfur (S) from customer, Responsibility is on customer.

12.3 Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended that you:

Connect any unused input terminal to VDD 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 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.

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 this is not specified in this specification.
● 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

No.	Item	Dimensions(mm)	Quantity	Remark
1	LCM Module	64.00*85.00*2.93	162PCS	
2	TRAY	385*340*21 (include 9pcs products/one tray)	9PCS	
3	SMALL CARTON	392*345*115 (include 81pcs products/one carton)	2PCS	
4	LARGE CARTON	405*355*260 (include 162pcs products/one carton)	1PCS	