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	2012-11-15	NEW ISSUE	

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	2.31"TFT	--
Dot arrangement	320(RGB)×240	dots
Color filter array	RGB vertical stripe	--
Display mode	TN / Transmission / Normally White	--
Viewing Direction	6 o'clock(Gray scale inversion)	--
Driver IC	ILI9342C	--
Module size	51.0(W)×45.8(H)×2.35(T)	mm
Active area	46.752(W)×35.064(H)	mm
Dot pitch	0.1461(W)×0.1461(H)	mm
Interface	i80-system 8/16 bit MCU interface	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	4 White LED In Parallel	--
Weight	TBD	g

3. External Dimensions

NOTES：
1. DISPLAY TYPE： 2.31"TFT
2. VIEWING DIRECTION： 6:00
3. LCD DRIVE IC： ILI9342
4. POLARIZER MODE： TRANSMISSIVE/POSITIVE
5. OPERATING TEMP： -10°C~+60°C
6. STORAGE TEMP： -20°C~+70°C
7. UNMARKER TOLERANCE： ±0.20
8. REQUIREMENTS ON ENVIRONMENTAL PROTECTION： RoHS

2.31" TFT
320*3(RGB)*240 DOTS
VIEWING DIRECTION

LED Circuit：

LEDA

LEDK1 LEDK2 LEDK3 LEDK4

双面胶(T=0.05mm)

FPC弯折示意图
展开出货

双面胶(T=0.05mm)

PIN	ASSIGNMENT
1	LEDA
2	LEDK1
3	LEDK2
4	LEDK3
5	LEDK4
6	GND
7	RESx
8	DB15
9	DB14
10	DB13
11	DB12
12	DB11
13	DB10
14	DB9
15	DB8
16	DB7
17	DB6
18	DB5
19	DB4
20	DB3
21	DB2
22	DB1
23	DB0
24	NC
25	RDX
26	WRX
27	DCX
28	CSX
29	IOVCC
30	VCC
31	FMARK
32	GND
33	NC
34	NC
35	NC
36	NC

SYM.	DESCRIPTION OF REVISION	REASON	REVISED BY	DATE
⚠	first issue	A	XC. SU	2012/11/15

TITLE: OUTLINE DIMENSION
DRAWN BY:
CHECKED BY:
APPROVED BY:
D/N:AM320240-023A
Rev:A
SCALE: 1:1
SHEET NO: 1 OF 1
UNIT: mm

于都上晴电子有限公司
YU DU AMSON ELECTRONICS Co.,Ltd.

4. Interface Description

PIN NO.	PIN NAME	DESCRIPTION
1	LEDA	Power supply for backlight anode input terminal.
2	LEDK1	Power supply for backlight cathode input terminals.
3	LEDK2	Power supply for backlight cathode input terminals.
4	LEDK3	Power supply for backlight cathode input terminals.
5	LEDK4	Power supply for backlight cathode input terminals.
6	GND	System power ground
7	RESX	Reset signal input terminal, active at 'L'.
8	DB15	DATA BUS. 8-bit interface: DB [7:0] is used. 16-bit interface: DB [15:0] is used.
9	DB14	
10	DB13	
11	DB12	
12	DB11	
13	DB10	
14	DB9	
15	DB8	
16	DB7	
17	DB6	
18	DB5	
19	DB4	
20	DB3	
21	DB2	
22	DB1	
23	DB0	
24	NC	No Connection
25	RDX	Read signal input terminal, Active at 'L'.
26	WRX	Write signal input terminal, Active at 'L'.
27	DCX	Register select signal input terminal: DCX='H': select a control register; DCX='L': select an index or status register.
28	CSX	Chip select signal input terminal, Active at 'L'.
29	IOVCC	Logic Supply Voltage (1.8V/2.8V).
30	VCC	Analog Supply Voltage (2.8V).
31	FMARK	Tearing effect output pin to synchronize MPU to frame writing.
32	GND	System power ground
33	NC	No Connection
34	NC	
35	NC	
36	NC	

5. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Logic Supply Voltage	IOVCC	-0.3	3.3	V
Analog Supply Voltage	VCC	-0.3	3.6	V
Input Voltage	Vin	-0.3	IOVCC+0.3	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	Remark
Logic Supply Voltage	IOVCC	1.65	1.8/2.8	3.3	V	--
Analog Supply Voltage	VCC	2.6	2.8	3.3	V	--
Input High Voltage	V_{IH}	0.8IOVCC	--	IOVCC	V	Digital input pins
Input Low Voltage	V_{IL}	GND	--	0.2IOVCC	V	Digital input pins
Output High Voltage	V_{OH}	0.8IOVCC	-	IOVCC	V	Digital output pins
Output Low Voltage	V_{OL}	GND	-	0.2IOVCC	V	Digital output pins
I/O Leak Current	I_{LI}	-1	--	1	uA	--

7. Timing Characteristics
7.1 i80-System Interface Timing Characteristics
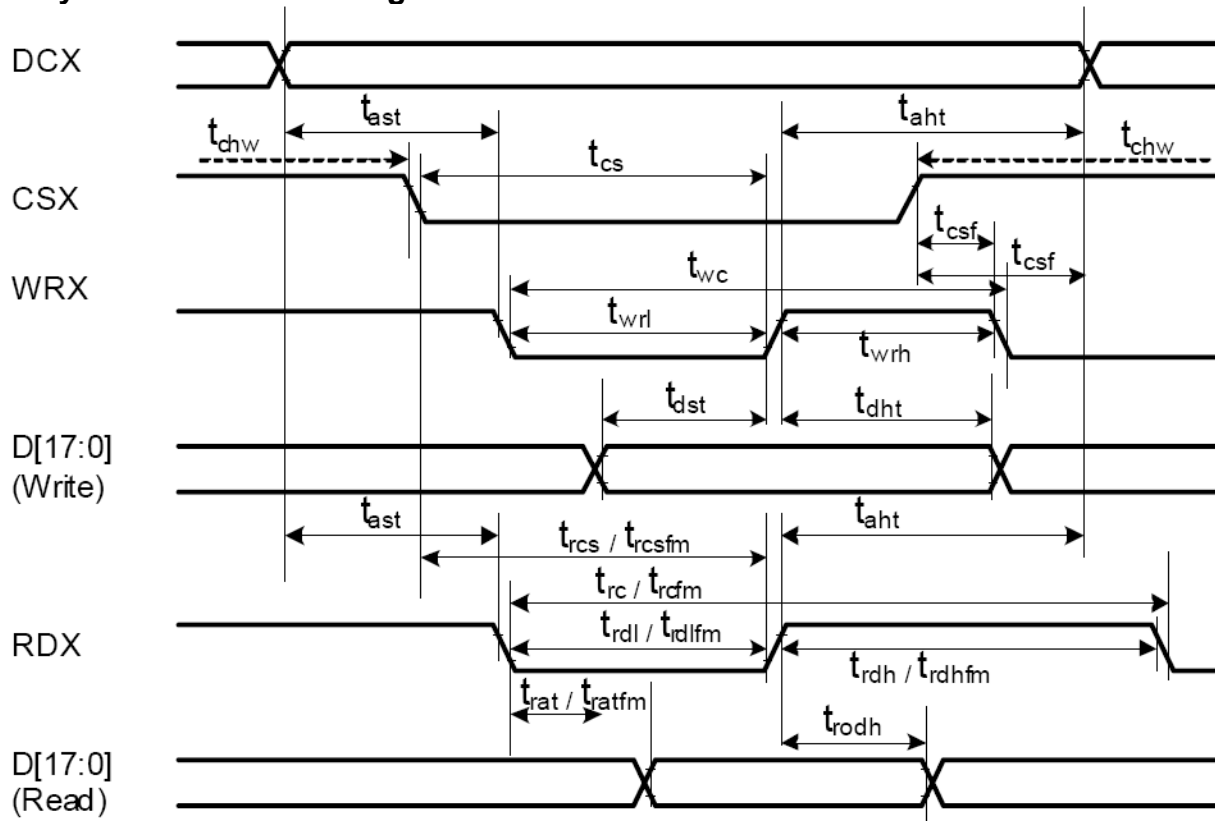
Signal	Symbol	Parameter	min	max	Unit	Description
DCX	t_{ast}	Address setup time	0	-	ns	
	t_{hat}	Address hold time (Write/Read)	10	-	ns	
CSX	t_{chw}	CSX "H" pulse width	0	-	ns	
	t_{cs}	Chip Select setup time (Write)	15	-	ns	
	t_{rcs}	Chip Select setup time (Read ID)	45	-	ns	
	t_{rcsfm}	Chip Select setup time (Read FM)	355	-	ns	
	t_{csf}	Chip Select Wait time (Write/Read)	10	-	ns	
WRX	t_{wc}	Write cycle	66		ns	
	t_{wrh}	Write Control pulse H duration	33	-	ns	
	t_{wrl}	Write Control pulse L duration	33	-	ns	
RDX (ID)	t_{rc}	Read cycle (ID)	160	-	ns	When read ID data
	t_{rdh}	Read Control pulse H duration	90	-	ns	
	t_{rdl}	Read Control pulse L duration	45	-	ns	
RDX (FM)	t_{rcfm}	Read Cycle (FM)	450	-	ns	When read from the frame memory
	t_{rdhfm}	Read Control H duration (FM)	90	-	ns	
	t_{rdlfm}	Read Control L duration (FM)	355	-	ns	
DB[17:0], DB[15:0], DB[8:0], DB[7:0]	t_{dst}	Write data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	t_{dht}	Write data hold time	10	-	ns	
	t_{rat}	Read access time	-	40	ns	
	t_{ratfm}	Read access time	-	50	ns	
	t_{rod}	Read output disable time	45	50	ns	

7.2 Reset Timing Characteristics
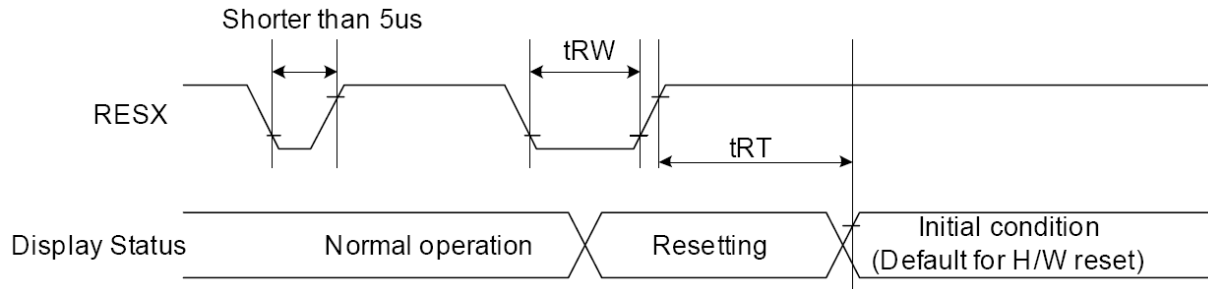
Signal	Symbol	Parameter	Min	Max	Unit
RESX	tRW	Reset pulse duration	10		uS
	tRT	Reset cancel		5 (note 1,5)	mS
				120 (note 1,6,7)	mS

8. Backlight Characteristics

LED Circuit:
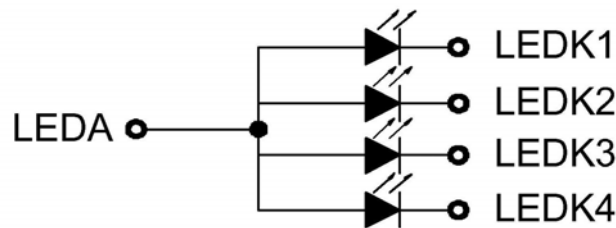
Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	3.0	3.2	3.5	V	If=60mA
Supply Current	If	--	60	80	mA	--
Luminous Intensity for LCM	--	200	230	--	Cd/m^2	If=60mA
Uniformity for LCM	--	80	--	--	％	If=60mA
Life Time	--	20000	--	--	Hr	If=60mA
Backlight Color	White					If=60mA

9. Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Transmittance		T	--	6.0	6.3	--	%	--
Contrast Ratio		CR	--	400	500	--	--	Note3
Response Time		Tr+Tf	25°C	--	20	30	ms	Note4
Viewing Angle	3H	θ3H(R)	CR≥10	60	70	--	--	Note5
	9H	θ9H(L)		60	70	--	--	
	6H	φ6H(D)		50	60	--	--	
	12H	φ12(U)		60	70	--	--	
Color Filter Chromaticity	White	x	$\theta=\varphi=0°$	0.255	0.305	0.355	--	Note6
		y		0.311	0.361	0.411	--	
		λ		--	--	--	--	
	Red	x	$\theta=\varphi=0°$	0.571	0.621	0.671	--	
		y		0.269	0.319	0.369	--	
		λ		--	--	--	--	
	Green	x	$\theta=\varphi=0°$	0.252	0.302	0.352	--	
		y		0.515	0.565	0.615	--	
		λ		--	--	--	--	
	Blue	x	$\theta=\varphi=0°$	0.087	0.137	0.187	--	
		y		0.114	0.164	0.214	--	
		λ		--	--	--	--	
	NTSC	--	--	45 %	50 %	--	--	

Note1.Ambient condition: 25°C±2°C, 60±10%RH, under 10 Lux in the darkroom.

Note2.Measure device: BM-5A (TOPCON), viewing cone=1°, IL=20mA.

1°

L=500mm
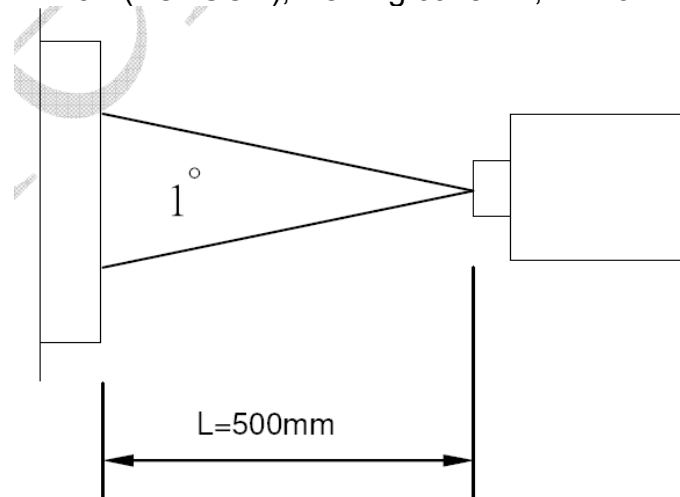
Note3. Definition of Contrast Ratio：

CR = White Luminance (ON) / Black Luminance (OFF)

Note4. Definition of response time：The response time is defined as the time interval between the 10% and 90% amplitudes.

White

90%   90%

Luminance

10%   10%

tr   Black   tf
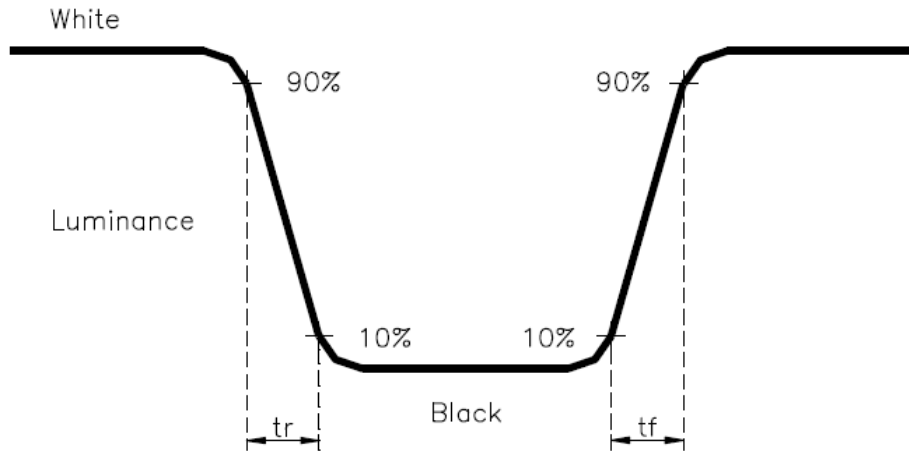
Note5. Definition of view angle(θ, φ)：

Upper(+)

θ ϕ

Left(-)   Right(+)

Panel   Lower(-)
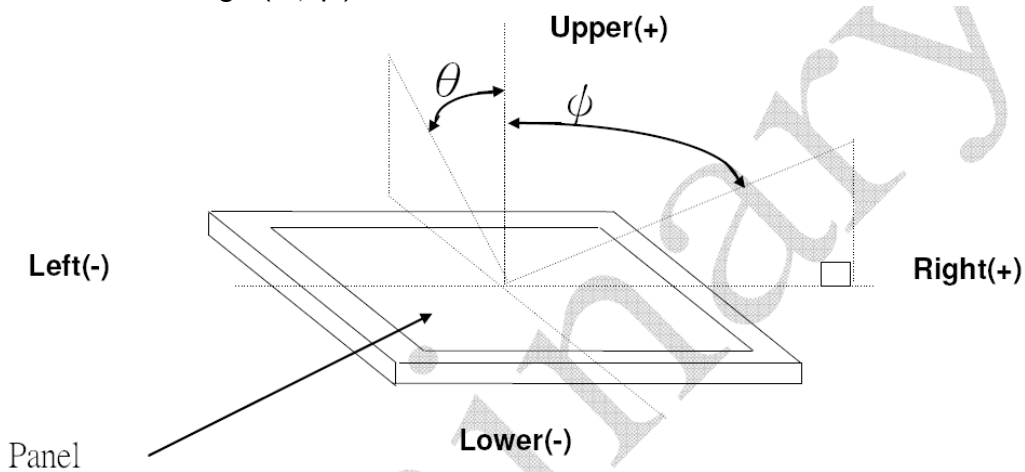
Note6. Light source: C light.

10. Reliability Test Conditions and Methods

NO.	TEST ITEMS	TEST CONDITION	INSPECTION AFTER TEST
	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, 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.
	Low Temperature Storage	-30°C±2°C×200Hours	
	High Temperature Operating	70°C±2°C×120Hours	
	Low Temperature Operating	-20°C±2°C×120Hours	
	Temperature Cycle(Storage)	-20°C ⟷ 25°C ⟷ 70°C (30min) (5min) (30min) 1cycle Total 10cycle	
	Damp Proof Test (Storage)	50°C±5°C×90%RH×120Hours	
	Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5M X,Y,Z direction for total 3hours (Packing Condition)	
	Drooping Test	Drop to the ground from 1M height one time every side of carton. (Packing Condition)	
	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.

11. Inspection Standard

This standard apply to C-STN/TFT module

1. **Spot check plan**：

   According to spot check level Ⅱ,MIL-STD-105D Level Ⅱ,the rank of accept or reject is below:

   3A、2A : major non-conformance : AQL 0.25 minor non-conformance : AQL 0.4

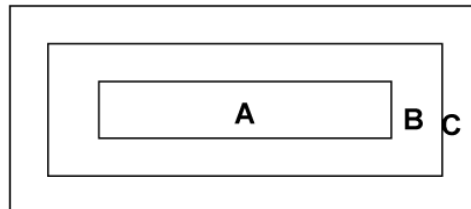   1A : major non-conformance : AQL 0.65   minor non-conformance : AQL 1.

2. **Inspection condition**：
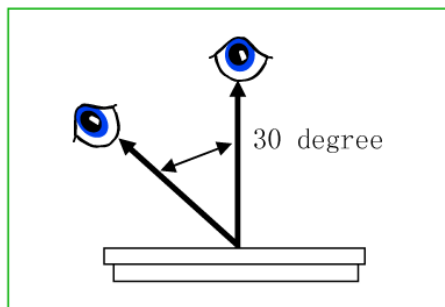
   30 degree

   Under daylight lamp 20～40W，product distance inspector 'eye 30cm,incline degree 30°。

3. **LCD area define**：

   Area A：display area

   Area B：VA area

   Area C：out of VA area, not in sight after assembly
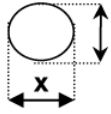
   Remark: non-conformance at area C, but is OK that isn't influence reliability of product & assembly by customer.
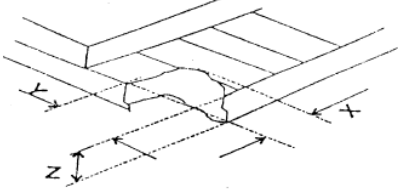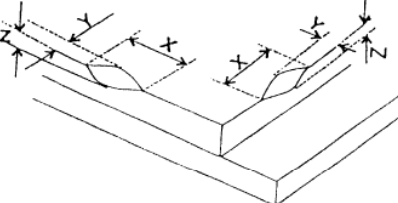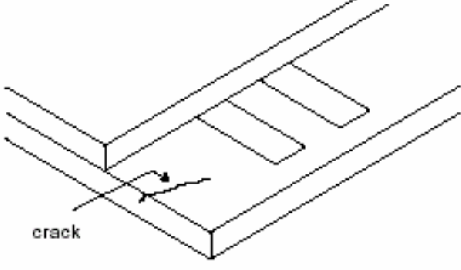
4. Inspection standard
4.1 Major non-conformance

NO.	Item	Inspection standard	Rate
4.1.1	Function non-conformance	1) No display, display abnormally 2) Miss line, short 3) B/L no function or function abnormally 4) TP no function	**major**
4.1.2	miss	No matter miss what component	
4.1.3	Out of size	Module dimension out of spec	

4.2 Appearance non-conformance

NO.	Item	Inspection standard	Rate
4.2.1	Black or white spot （power on）	dot non-conformance define Φ $\Phi = \dfrac{+y)}{2}$ x (**A grade** 	area size（mm）	Most approve q'ty		
	A	B	C
Φ≤0.10	ignore		
0.10＜Φ≤0.15	4		ignore
0.15＜Φ≤0.20	2		
0.20＜Φ≤0.25	1		
0.25＜Φ	0			 **Most approve 4 damages, dot to dot ≥10mm**	**Minor**
4.2.2	Black or white line （power on）	**A grade** | Size(mm)		Most approve q'ty		
L(length）	W(width)	A	B	C
ignore	W≤0.03	ignore		
L≤5.0	0.03＜W≤0.05	3		ignore
L≤3.0	0.05＜W≤0.07	2		
	0.07＜W	Treat with dot non-conformance			 **Most approve 3 damages, line to line ≥10mm**	**Minor**

Within 4.2.1 dot diagram: y, x

4.2.3	Polarizer position	1) Polarizer attach meet drawing, disallow out of LCD. 2) Polarizer must cover display area（special require unless）	Minor
4.2.4	LCD non-conform ance	(i) crash at side（remark: S=ITO length） **Crash disallow extend to ITO or seal.** (ii) commonly surface scathe (iii) crack **Disallow extend crack** 	Minor

(i) table:

X	Y	Z
≤3.0	≤S	ignore

(ii) table:

X	Y	Z
≤2.0	<frame edge	ignore

4.2.5	Contrast voltage warp	VOP/Vlcd voltage of confirmed sample±0.15V	Minor
4.2.6	color	Color & luminance of module scope reference spec	Minor
4.2.7	Cross talk	Reference confirmed limit sample	Minor

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 VCC 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 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