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	2017-12-22	NEW ISSUE	

Table of Contents

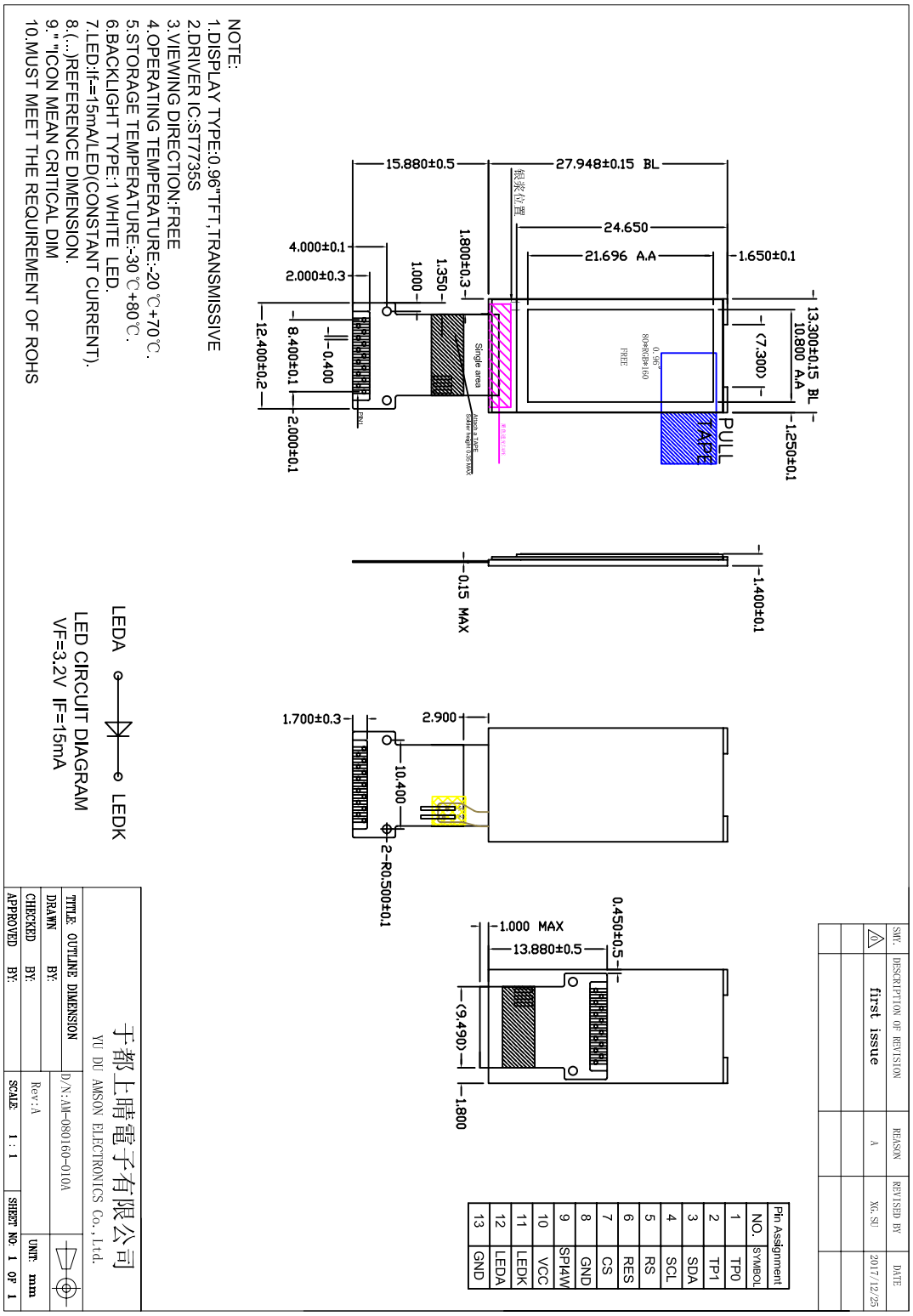
1. Scope

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	0.96”TFT	--
Dot arrangement	80(RGB)×160	dots
Color filter array	RGB vertical stripe	--
Display mode	Normally white / Transmissive	--
Viewing Direction	ALL	--
Driver IC	ST7735S	--
Module size	13.3(W)×27.948(H)×1.4(T)	mm
Active area	10.8(W)×21.696(H)	mm
Pixel pitch	0.135(W)×0.1356(H)	mm
Interface	3/4-wire-SPI	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	1 White LED	--
Weight	TBD	g

3. External Dimensions



4. Interface Description

PIN NO.	PIN NAME	DESCRIPTION
1	TP0	Touch pin,if not used,please open this pin.
2	TP1	Touch pin,if not used,please open this pin.
3	SDA	It is used as serial input/output pin in serial interface.
4	SCL	The serial clock signal for system..
5	RS	In 4-line SPI, this pin is used as D/CX (data/ command selection); In 3-line SPI, should be fixed at VDDI or DGND.
6	RES	-This signal will reset the device and it must be applied to properly initialize the chip. -Signal is active low.
7	CS	Chip Selection Pin.-Low Enable.
8	GND	Ground
9	SPI4W	- SPI4W='0', 3-line SPI Enable. - SPI4W='1', 4-line SPI Enable. -If Not Used, Please fix this Pin at DGND Level.
10	VCC	Power supply for system.
11	LEDK	LED backlight Canode
12	LEDA	LED backlight Anode
13	GND	Ground

5. Absolute Maximum Ratings

Item	Symbol	Min	Type	Max	Unit
Power Supply	VCC	-0.3	-	5.0	V
Operating Temperature	TOPR	-20	-	70	°C
Storage Temperature	TSTG	-30	-	80	°C

6. DC Characteristics

Item	Symbol	Min.	Type	Max.	Unit	
Power supply	Vcc	3.0	3.3	3.5	V	
Input High Voltage	V_{IH}	0.8VCC	--	VCC	V	Digital input pins
Input Low Voltage	V_{IL}	GND	--	0.2VCC	V	Digital input pins
Output High Voltage	V_{OH}	VCC-0.4	--	VCC	V	Digital output pins
Output Low Voltage	V_{OL}	GND	--	GND+0.4	V	Digital output pins
I/O Leak Current	Icc	-	1.5	2.5	mA	Normal mode

7. Timing Characteristics

7.1 Serial Interface Characteristics(3-line Serial)

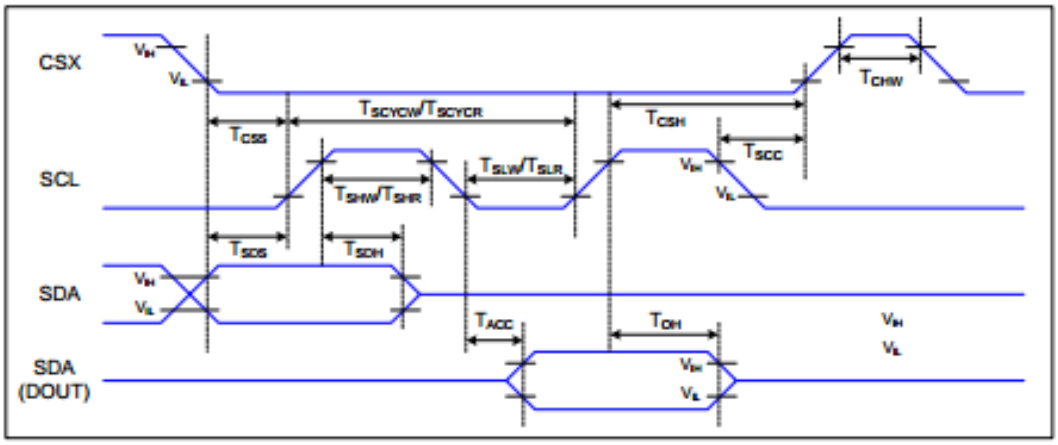


Figure 6 3-line Serial Interface Timing

Ta=25 ℃, VDDI=1.65~3.7V, VDD=2.5~4.8V

Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	TCSS	Chip Select Setup Time (Write)	15		ns	
	TCSH	Chip Select Hold Time (Write)	15		ns	
	TCSS	Chip Select Setup Time (Read)	60		ns	
	TSCC	Chip Select Hold Time (Read)	65		ns	
	TCHW	Chip Select "H" pulse width	40		ns	
SCL	TSCYCW	Serial Clock Cycle (Write)	66		ns	
	TSHW	SCL "H" Pulse Width (Write)	15		ns	
	TSLW	SCL "L" Pulse Width (Write)	15		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 (DIN) (DOUT)	TSDS	Data Setup Time	10		ns	For Maximum CL=30pF For Minimum CL=8pF
	TSDH	Data Hold Time	10		ns	
	TACC	Access Time	10	50	ns	
	TOH	Output Disable Time	15	50	ns	

7.2 Serial Interface Characteristics(4-line Serial)

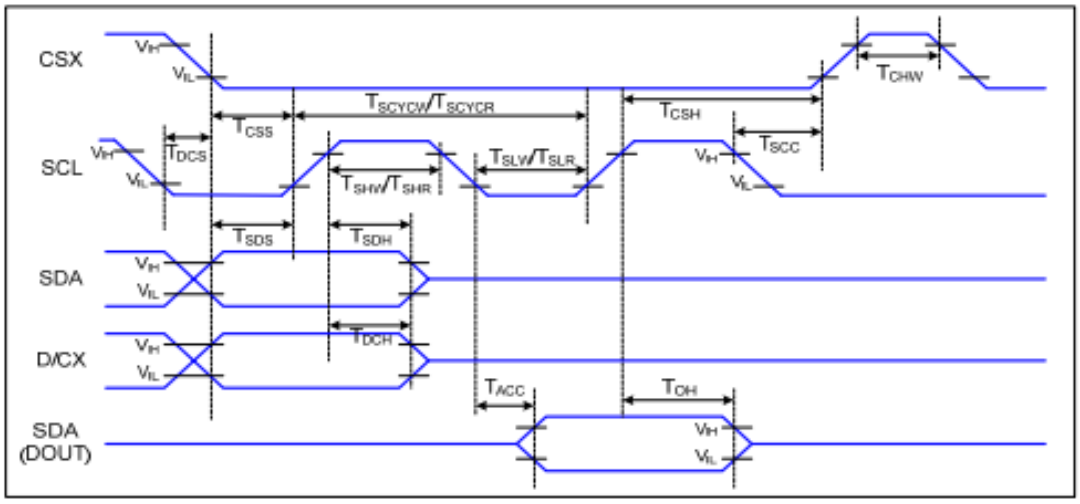
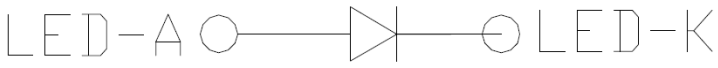


Figure 7 4-line Serial Interface Timing

Ta=25 ℃, VDDI=1.65~3.7V, VDD=2.5~4.8V

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	TCSS	Chip Select Setup Time (Write)	45		ns	
	TCSH	Chip Select Hold Time (Write)	45		ns	
	TCSS	Chip Select Setup Time (Read)	60		ns	
	TSCC	Chip Select Hold Time (Read)	65		ns	
	TCHW	Chip Select "H" Pulse Width	40		ns	
SCL	TSCYCW	Serial Clock Cycle (Write)	66		ns	-Write Command & Data Ram
	TSHW	SCL "H" Pulse Width (Write)	15		ns	
	TSLW	SCL "L" Pulse Width (Write)	15		ns	
	TSCYCR	Serial Clock Cycle (Read)	150		ns	-Read Command & Data Ram
	TSHR	SCL "H" Pulse Width (Read)	60		ns	
	TSLR	SCL "L" Pulse Width (Read)	60		ns	
D/CX	TDCS	D/CX Setup Time	10		ns	
	TDCH	D/CX Hold Time	10		ns	
SDA (DIN) (DOUT)	TSDS	Data Setup Time	10		ns	For Maximum CL=30pF For Minimum CL=8pF
	TSDH	Data Hold Time	10		ns	
	TACC	Access Time	10	50	ns	
	TOH	Output Disable Time	15	50	ns	

8. Backlight Characteristics

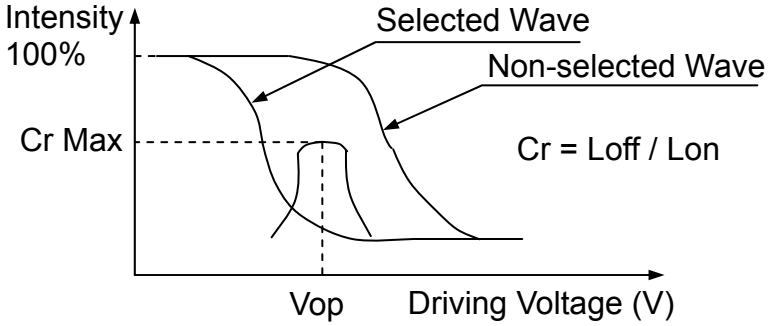


Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	2.9	3.2	3.5	V	If=15mA
Supply Current	If	-	15	-	mA	
Luminous Intensity for LCM	Lv	150	200	250	cd/㎡	If=15mA
Uniformity(with L/G)	△Bp	80			%	If=15mA
Life Time		30000			Hr	If=15mA
Backlight Color	White					

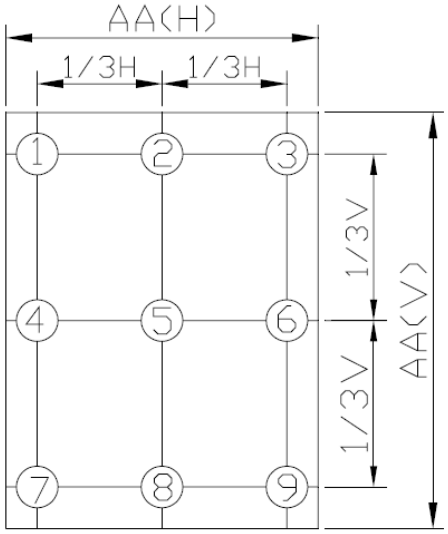
9. Optical Characteristics

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
Response Time		Tr+Tf	25℃	--	(30)	--	msec	
Contrast Ratio		CR			(800)	--		Note 3
Viewing Angle	Upper	θ	CR≧10	--	80	--	Deg	Note 5
	Down			--	80	--	Deg	
	Right	φ		--	80	--	Deg	
	Left			--	80	--	Deg	
Color Filter Chromaticity	White	X	θ =φ= 0°	--	(0.306)	--	--	Note 6
		y		--	(0.327)	--	--	
	Red	X	θ =φ= 0°	--	(0.610)	--	--	
		y		--	(0.333)	--	--	
	Green	X	θ =φ= 0°	--	(0.281)	--	--	
		y		--	(0.533)	--	--	
	Blue	X	θ =φ= 0°	--	(0.146)	--	--	
		y		--	(0.138)	--	--	

Note1: Definition of Operation Voltage (Vop)



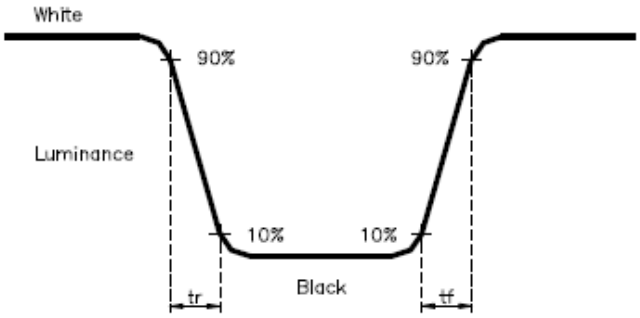
Note2: Definition of Luminance Uniformity：L = L(MIN) / L (MAX) × 100%



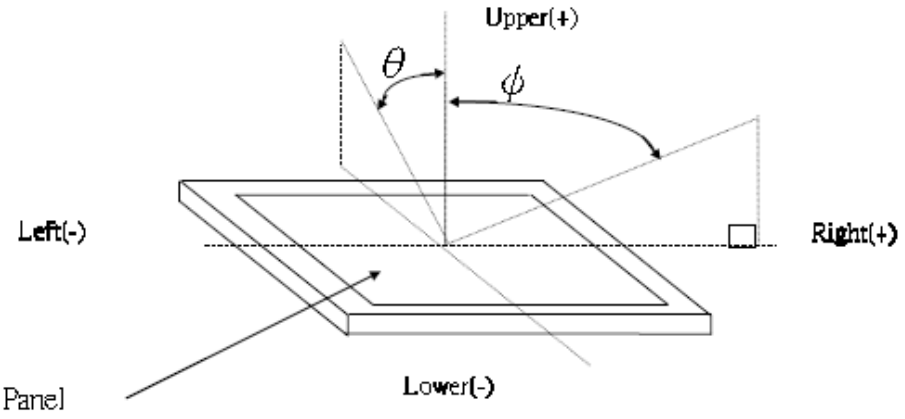
Note 3. Definition of Contrast Ratio：

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

Note 4. Definition of response time：The response time is defined as the time interval between the 10% and 90% amplitudes.



Note 5. Definition of view angle(θ，ψ)：



Note 6. Light source: C light.

10. Reliability Test Conditions and Methods

NO.	TEST ITEMS	TEST CONDITION	INSPECTION AFTER TEST
①	High Temperature Storage	80°C±2°C×240Hours	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×240Hours	
③	High Temperature Operating	70°C±2°C×240Hours	
④	Low Temperature Operating	-20°C±2°C×240Hours	
⑤	Temperature Cycle(Storage)	-30°C ⟺ 25°C ⟺ 80°C (30min) (5min) (30min) 1cycle Total 20cycle	
⑥	High Temperature &Humidity operating	60°C±5°C×90%RH×96Hours	
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:
1, The Test samples should be applied to only one test item.
2, Sample side for each test item is 2~5pcs.
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. Handling Precautions

11.1 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.

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 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 (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 VDDIO 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.

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 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.

13. Packing Method

TBD