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	2013-07-16	NEW ISSUE	

Table of Contents

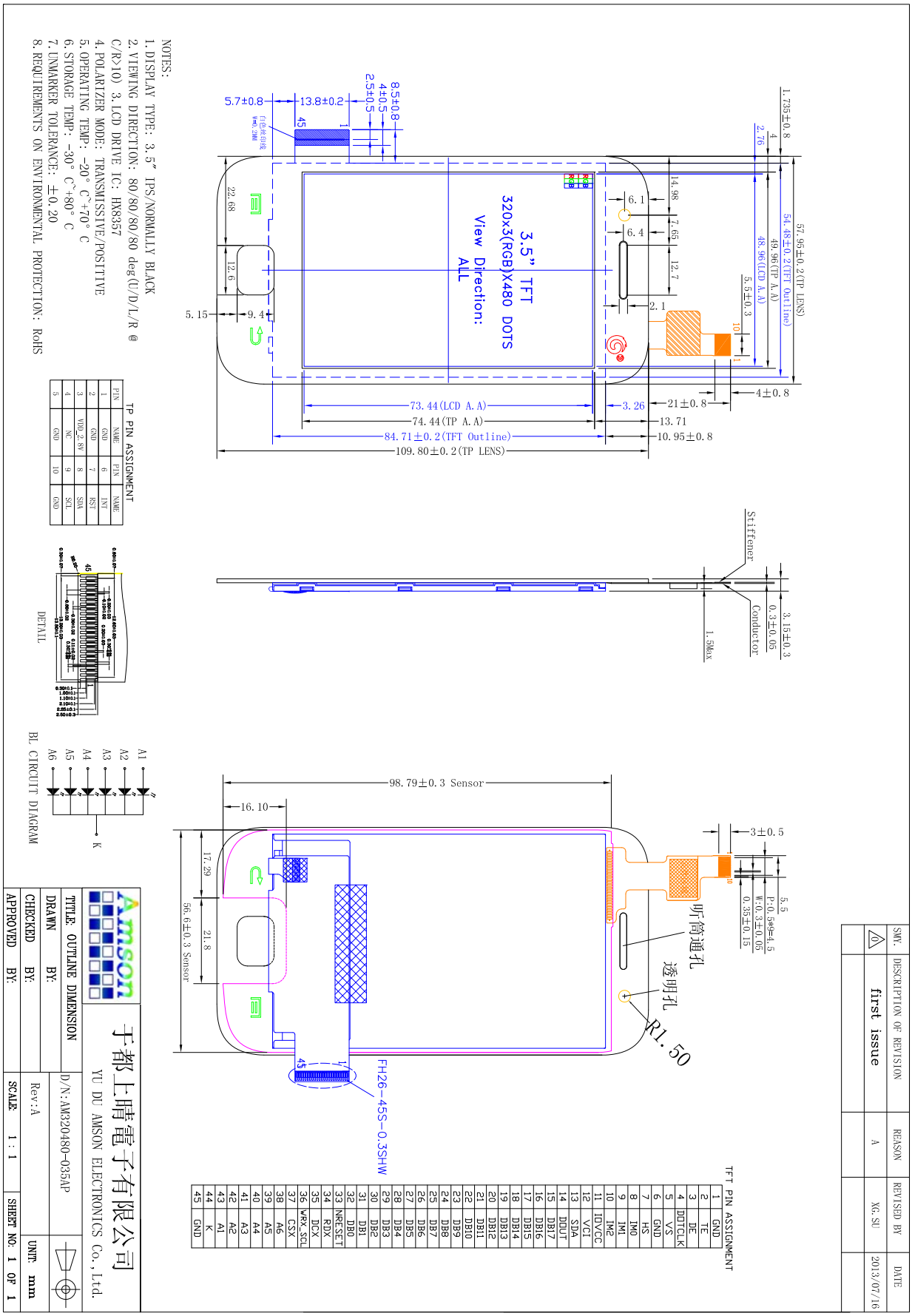
1. Scope

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	3.5"TFT	--
Dot arrangement	320(RGB)×480	dots
Color filter array	RGB vertical stripe	--
Display mode	IPS / Transmission / Normally Black	--
Viewing Direction	80/80/80/80 deg(U/D/L/R @ C/R>10)	--
Driver IC	HX8357	--
Module size	57.95(W)×109.80(H)×3.15(T)	mm
Active area	48.96(W)×73.44(H)	mm
Dot pitch	0.153(W)×0.153(H)	mm
Interface	4-lines_8bit / 3-lines_9bit SPI 8-/ 9-/16-/18-bit 8080-series system interface 16-/18-bit RGB interface	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	6 White LED	--
Weight	TBD	g

3. External Dimensions



4. Interface Description

4.1 TFT interface

<table>
<tr><th>Pin</th><th>Symbol</th><th>Description.</th></tr>
<tr><td>1</td><td>GND</td><td>Power ground</td></tr>
<tr><td>2</td><td>TE</td><td>Tearing effect output pin to synchronize MCU to frame writing.</td></tr>
<tr><td>3</td><td>DE</td><td>Data enable signal in RGB I/F mode</td></tr>
<tr><td>4</td><td>DOTCLK</td><td>Pixel clock signal in RGB I/F.</td></tr>
<tr><td>5</td><td>VS</td><td>Vertical sync signal in RGB I/F.</td></tr>
<tr><td>6</td><td>GND</td><td>Power ground</td></tr>
<tr><td>7</td><td>HS</td><td>Horizontal sync signal in RGB I/F.</td></tr>
<tr><td>8</td><td>IM0</td><td rowspan="3">System interface Mode
<table>
<tr><th>IM2</th><th>IM1</th><th>IM0</th><th>interface mode</th><th>DB Pin</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>8080 18-bit interface</td><td>DB[17:0]</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>8080 9-bit interface</td><td>DB[8:0]</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>8080 16-bit interface</td><td>DB[15:0]</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>8080 8-bit interface</td><td>DB[7:0]</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>3-wire_9-bit SPI</td><td>CSX,SDA,SCL</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>4-wire_8-bit SPI</td><td>CSX,DCX,SDA,SCL</td></tr>
</table></td></tr>
<tr><td>9</td><td>IM1</td></tr>
<tr><td>10</td><td>IM2</td></tr>
<tr><td>11</td><td>IOVCC</td><td>A supply voltage to the logic circuit.</td></tr>
<tr><td>12</td><td>VCI</td><td>A supply voltage to the analog circuit.</td></tr>
<tr><td>13</td><td>SDA</td><td>Serial input signal in SPI I/F.</td></tr>
<tr><td>14</td><td>DOUT</td><td>Serial output signal in SPI I/F.</td></tr>
<tr><td>15</td><td>DB17</td><td rowspan="18">18-bit parallel bi-directional data bus for MPU system:
8-bit I/F: DB [7:0] is used.
9-bit I/F: DB [8:0] is used.
16-bit I/F: DB [15:0] is used.
24-bit I/F: DB [17:0] is used.

18-bit input data bus for RGB I/F.
16-bit/pixel: DB[17:13]=R[4:0], DB[11:6]=G[5:0] and DB[5:1]=B[4:0];
18-bit/pixel: DB[17:12]=R[5:0], DB[11:6]=G[5:0] and DB[5:0]=B[5:0];
Connect unused pins to GND.</td></tr>
<tr><td>16</td><td>DB16</td></tr>
<tr><td>17</td><td>DB15</td></tr>
<tr><td>18</td><td>DB14</td></tr>
<tr><td>19</td><td>DB13</td></tr>
<tr><td>20</td><td>DB12</td></tr>
<tr><td>21</td><td>DB11</td></tr>
<tr><td>22</td><td>DB10</td></tr>
<tr><td>23</td><td>DB9</td></tr>
<tr><td>24</td><td>DB8</td></tr>
<tr><td>25</td><td>DB7</td></tr>
<tr><td>26</td><td>DB6</td></tr>
<tr><td>27</td><td>DB5</td></tr>
<tr><td>28</td><td>DB4</td></tr>
<tr><td>29</td><td>DB3</td></tr>
<tr><td>30</td><td>DB2</td></tr>
<tr><td>31</td><td>DB1</td></tr>
<tr><td>32</td><td>DB0</td></tr>
</table>

33	NRESET	Reset input pin, Active “L”.
34	RDX	Reads strobe signal to write data when RD is “Low” in MPU interface.
35	DCX	Display data / command selection in 80-series MPU I/F. DCX = ”0” : Command DCX = ”1” : Display data.
36	WRX_SCL	Writes strobe signal to write data when WRX is “Low” in MPU I/F. A synchronous clock signal in SPI I/F.
37	CSX	Chip select input pin (“Low” enable) in MPU I/F and SPI I/F.
38	A6	LED backlight (Anode).
39	A5	LED backlight (Anode).
40	A4	LED backlight (Anode).
41	A3	LED backlight (Anode).
42	A2	LED backlight (Anode).
43	A1	LED backlight (Anode).
44	K	LED backlight (Cathode).
45	GND	Power ground.

4.2 CTP interface

Pin	Symbol	Description.
1	GND	Power ground.
2	GND	Power ground.
3	VDD_2.8V	Supply voltage.
4	NC	No Connection.
5	GND	Power ground.
6	INT	External interrupt INT to the host, it is active low when finger touching on the Screen.
7	RST	Reset.
8	SDA	I2C Serial Clock.
9	SCL	I2C Serial Data.
10	GND	Power ground.

5. Absolute Maximum Ratings

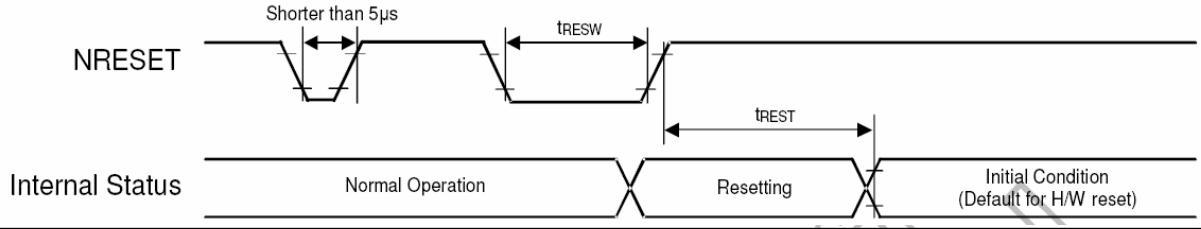
Item	Symbol	Min.	Max.	Unit
Logic Supply Voltage	IOVCC	-0.3	4.6	V
Analog Supply Voltage	VCI	-0.3	4.6	V
Input Voltage	Vin	-0.3	IOVCC+0.3	V
Operating Temperature	TOP	-20	70	°C
Storage Temperature	TST	-30	80	°C
Storage Humidity	HD	20	90	%RH

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	VCI	2.5	2.8	3.3	V	-
Input High Voltage	V_{IH}	0.7IOVCC	-	IOVCC	V	Digital input pins
Input Low Voltage	V_{IL}	-0.3	-	0.3IOVCC	V	Digital input pins
Output High Voltage	V_{OH}	0.8IOVCC	-	IOVCC	V	Digital output pins
Output Low Voltage	V_{OL}	0	-	0.2IOVCC	V	Digital output pins
I/O Leak Current	I_{LI}	-1.0	-	1.0	μA	-

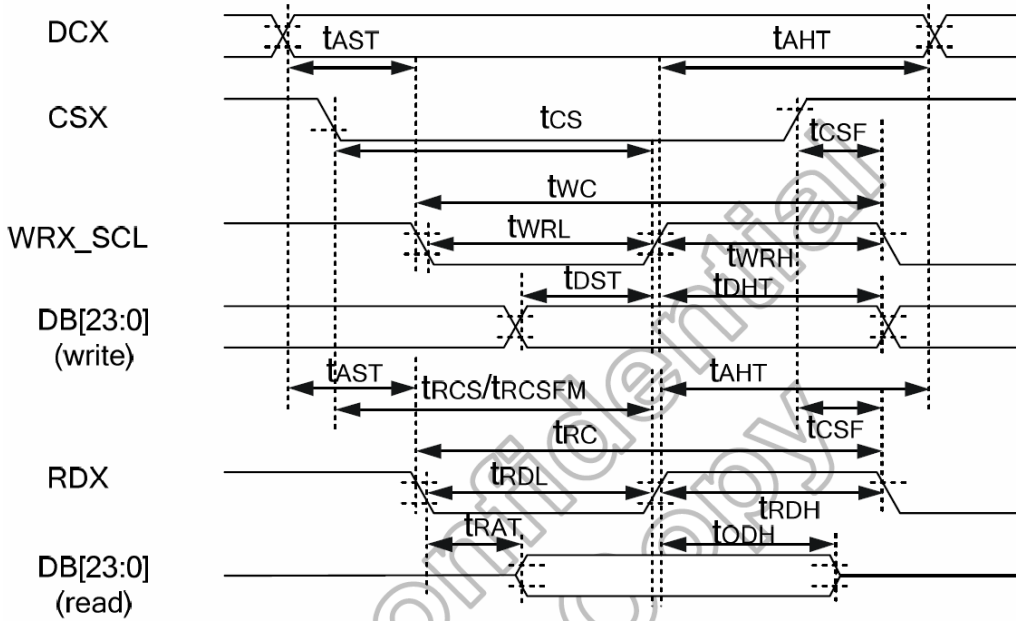
7. Timing Characteristics

7.1 Reset Timing Characteristics



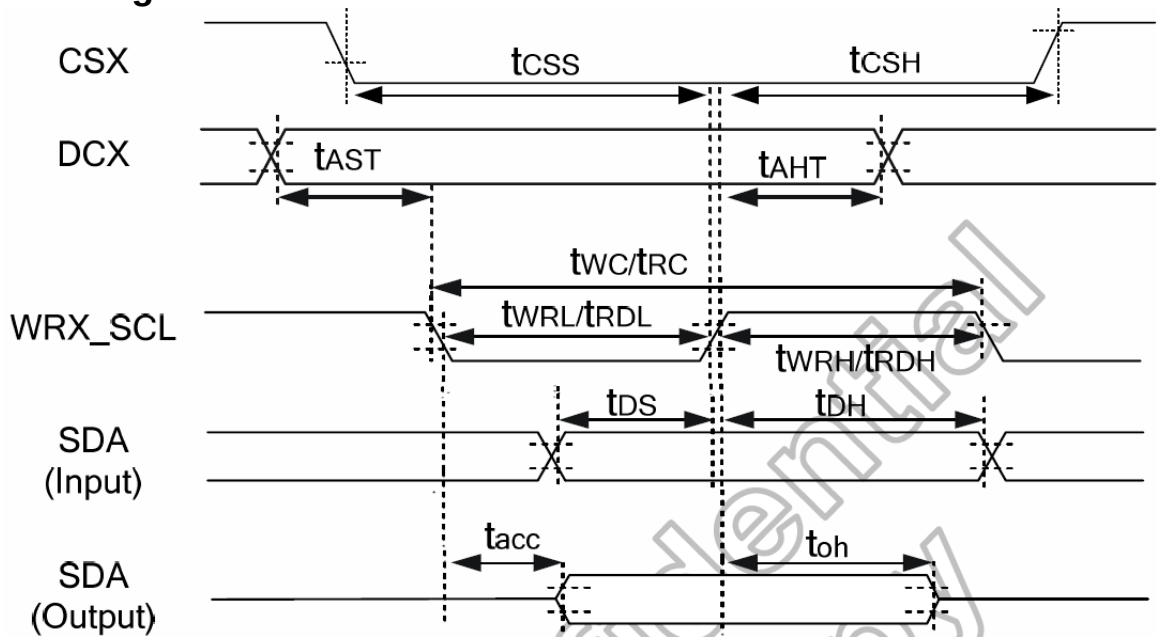
Symbol	Parameter	Related Pins	Spec.			Note	Unit
			Min.	Typ.	Max.		
tRESW	Reset low pulse width(1)	NRESET	10	-	-	-	µs
tREST	Reset complete time(2)	-	5	-	-	When reset applied during SLPIN mode	ms
		-	120	-	-	When reset applied during SLPOUT mode	ms

7.2 i80-System Interface Timing Characteristics



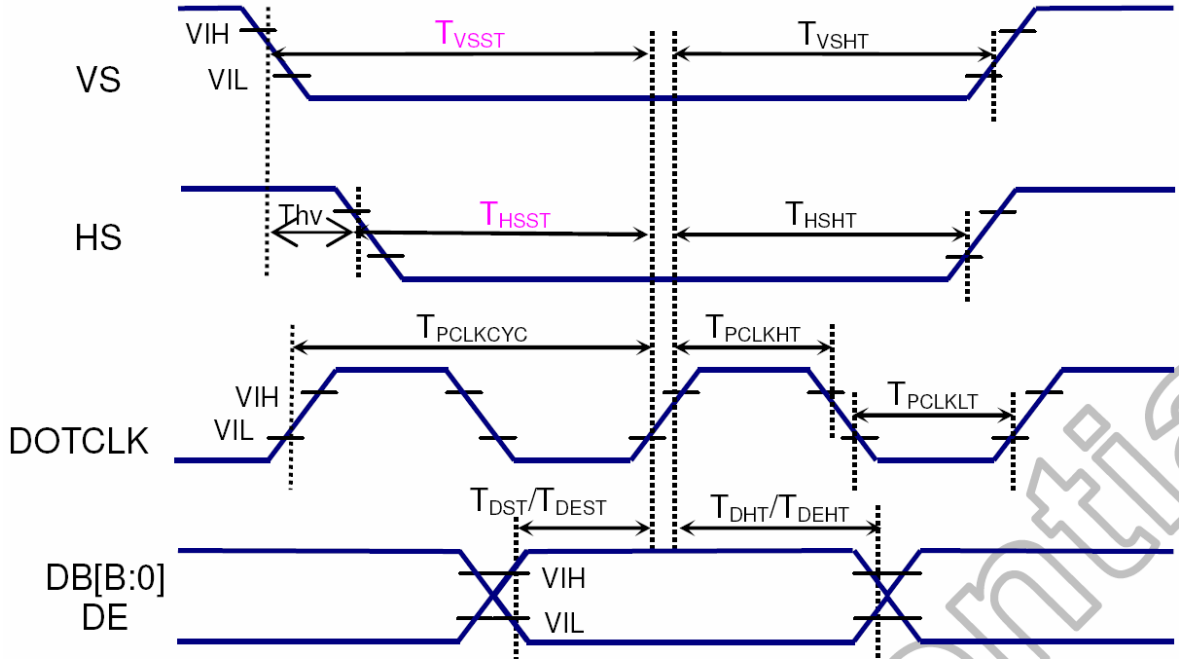
Signal	Symbol	Parameter	Min.	Max.	Unit
DCX	t_{AST}	Address setup time	0	-	ns
	t_{AHT}	Address hold time (Write/Read)	10	-	
CSX	t_{CS}	Chip select setup time (Write)	10	-	ns
	t_{RCS}	Chip select setup time (Read register)	45	-	
	t_{RCSFM}	Chip select setup time (GRAM)	355	-	
	t_{CSF}	Chip select wait time (Write/Read)	10	-	
WRX_SCL	t_{WC}	Write cycle (write register)	50	-	ns
	t_{WC}	Write cycle (write GRAM@SLPOUT)	47	-	
	t_{WC}	Write cycle (write GRAM@SLPIN)	100	-	
	t_{WRH}	Control pulse “H” duration	15	-	
	t_{WRL}	Control pulse “L” duration	15	-	
RDX	t_{RC}	Read cycle (read register)	160	-	ns
	t_{RC}	Read cycle (GRAM)	450	-	
	t_{RDH}	Control pulse “H” duration	90	-	
	t_{RDL}	Control pulse “L” duration(read register)	35	-	
	t_{RDL}	Control pulse “L” duration(GRAM)	345	-	
DB[23:0]	t_{DST}	Data setup time	10	-	ns
	t_{DHT}	Data hold time	10	-	
	t_{RAT}	Read access time(read register)	-	40	
	t_{RAT}	Read access time(GRAM)	-	340	
	t_{ODH}	Output disable time	20	80	

7.3 SPI Timing Characteristics



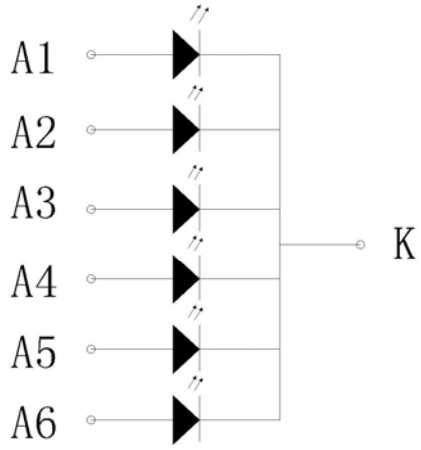
Signal	Symbol	Parameter	Min.	Max.	Unit	Description
CSX	t_{CSS}	Chip select setup time (Write)	15	-	ns	-
	t_{CSS}	Chip select setup time (Read)	60	-		
	t_{CSH}	Chip select hold time (Write)	15	-		
	t_{CSH}	Chip select hold time (Read)	65	-		
DCX	t_{AST}	Address setup time	0	-	ns	-
	t_{AHT}	Address hold time (Write/Read)	10	-		
WRX_SCL (Write)	t_{WC}	Write cycle	66	-	ns	-
	t_{WRH}	Control pulse “H” duration	15	-		
	t_{WRL}	Control pulse “L” duration	15	-		
WRX_SCL (Read)	t_{RC}	Read cycle	150	-	ns	-
	t_{RDH}	Control pulse “H” duration	60	-		
	t_{RDL}	Control pulse “L” duration	60	-		
SDA (Input)	t_{DS}	Data setup time	10	-	ns	For maximum C_L=30pF For minimum C_L=8pF
	t_{DH}	Data hold time	10	-		
SDA (Output)	t_{ACC}	Read access time	10	50	ns	
	t_{OH}	Output disable time	15	50		

7.4 Parallel 18/16-bit RGB Interface Timing Characteristics



Item	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Pixel low pulse width	T_{CLKLT}		15	-	-	ns
Pixel high pulse width	T_{CLKHT}		15	-	-	ns
Vertical Sync. set-up time	T_{VSST}		15	-	-	ns
Vertical Sync. hold time	T_{VSHT}		15	-	-	ns
Horizontal Sync. set-up time	T_{HSST}		15	-	-	ns
Horizontal Sync. hold time	T_{HSHT}		15	-	-	ns
Data Enable set-up time	T_{DEST}		15	-	-	ns
Data Enable hold time	T_{DEHT}		15	-	-	ns
Data set-up time	T_{DST}		15	-	-	ns
Data hold time	T_{DHT}		15	-	-	ns
Phase difference of sync signal falling edge	Thv		0	-	320	Dotclk

8. Backlight Characteristics



BL CIRCUIT DIAGRAM

Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	3.0	3.3	3.5	V	If=90mA
Supply Current	If	--	90	120	mA	--
Luminous Intensity for LCM	--	200	240	--	Cd/m^2	If=90mA
Uniformity for LCM	--	80	--	--	%	If=90mA
Life Time	--	50000	--	--	Hr	If=90mA
Backlight Color	White					

9. Capacitive Touch Panel

9.1 Features

Item	Description
TP Structure	PMMA /Glass
Sensor Structure	single side ITO
Controller IC	FT6206
Sensing	Mutual
Touch Points	Max 2 Points
Interface Type	I2C
Connector (with Host)	ZIF
TP OD (with Cover)	109.8*57.95mm
TP AA	74.44*49.96mm
TP VA	74.44*49.96mm (3.5inch)
Channel	11*2
Touch key	In Sensor AA
Touch key controller IC	NC

9.2 Mechanical

Item	Description	Note
Operate	Finger	
Linearity	<5%	
Surface hardness (H)	≥6H	500g
FPC Peeling	500g	Peeling direction: 90°; Velocity: 50mm/min.
FPC Bending	After the test meet the electrical properties	Angle:180°; Radius: R1.0mm; 10times.

9.3 Electrical

Item	Description	Note
Power supply voltage	2.8V	
I/O supply voltage	2.8V	
Current consumption (Normal mode)	6.36mA	
Current consumption (Green mode)	3.8mA	
Current consumption (Sleep mode)	100uA	
Supply noise	≦50mV	

10. Optical Characteristics

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25 °C. The values specified are at an approximate distance 50cm from the TFT-LCD surface at a viewing angle of Φ and θ equal to 0°. Measurement condition: Refer to next pages (LED back light with 20 mA/1 ea)

*1): with LGD Polarizer;

*2): Only Color Filter glass

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
*1) Threshold Voltage	Vsat	4.0	4.1	4.2	V	Fig.2
	Vth	1.9	2.0	2.1	V	
*1) Transmittance	T(%)		4.4	-	%	Fig.1
*1) Contrast Ratio	C/R	-	500	-		
*1) Response Time	Tr+Tf	-	35	45	msec	Fig.3, Fig.5
*2) CIE Color Coordinate	Rx	0.637	0.657	0.677		
	Ry	0.300	0.320	0.340		
	Gx	0.269	0.289	0.309		
	Gy	0.569	0.589	0.609		
	Bx	0.118	0.138	0.158		
	By	0.060	0.080	0.100		
	Wx	0.290	0.310	0.330		
	Wy	0.309	0.329	0.349		
*1) Viewing Angle	Θl	-	80	-	Degree	C/R>10 Fig.4
	Θr	-	80	-		
	Θu	-	80	-		
	Θd	-	80	-		

Notes:

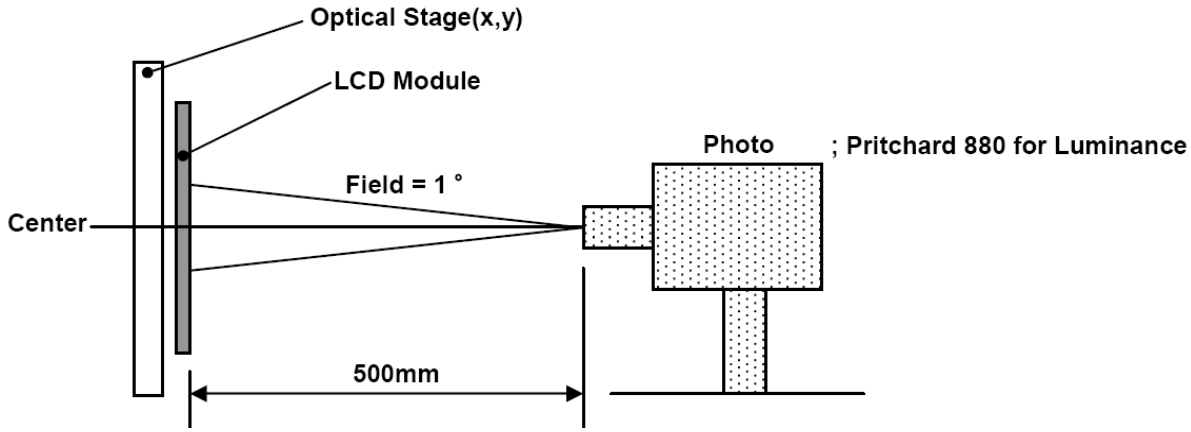
1. Contrast Ratio (CR) is defined mathematically as:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

2. Surface luminance is the center point across the TFT-LCD surface 500mm from the surface with all pixels displaying white. For more information see FIG 1.
3. Response time is the time required for the display to transition from white to black (Rise Time, Tr) and from black to white (Falling Time, Tf). For additional information see FIG 3.
4. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the TFT-LCD surface. For more information see FIG 5.
5. Optimum contrast is obtained by adjusting the TFT-LCD threshold voltage (Vth & Vsat).

FIG. 1 Optical Characteristic Measurement Equipment and Method

[Test Equipment Set Up]



Measuring Condition;
-Measuring surroundings: Darkroom
-Measuring temperature: Ta=25℃
-Adjust operating voltage to get optimum contrast at the center of the display.
-Measured value at the center point of LCD panel after more than 30 minutes while backlight turning on.

FIG. 2 The definition of Vth and Vsat

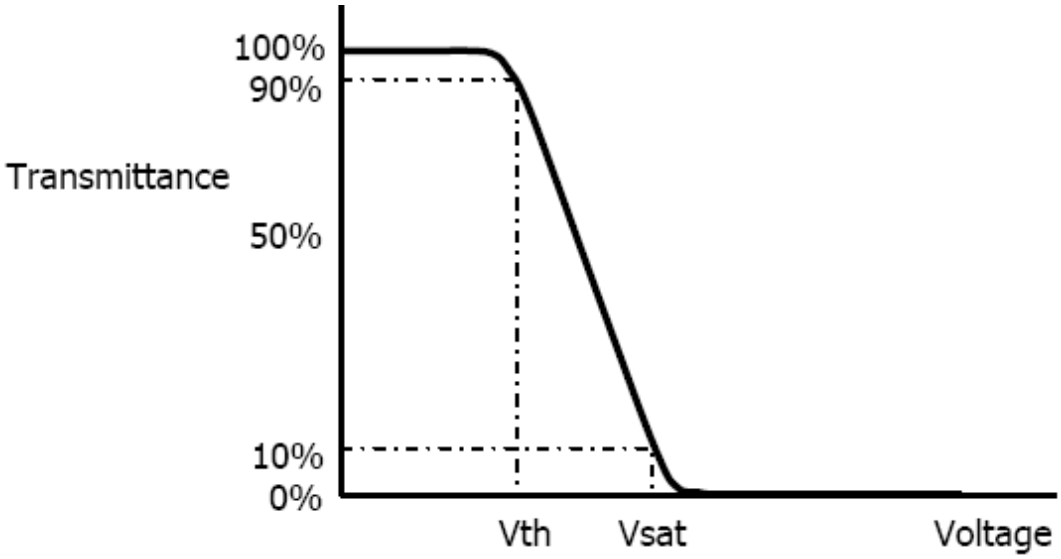
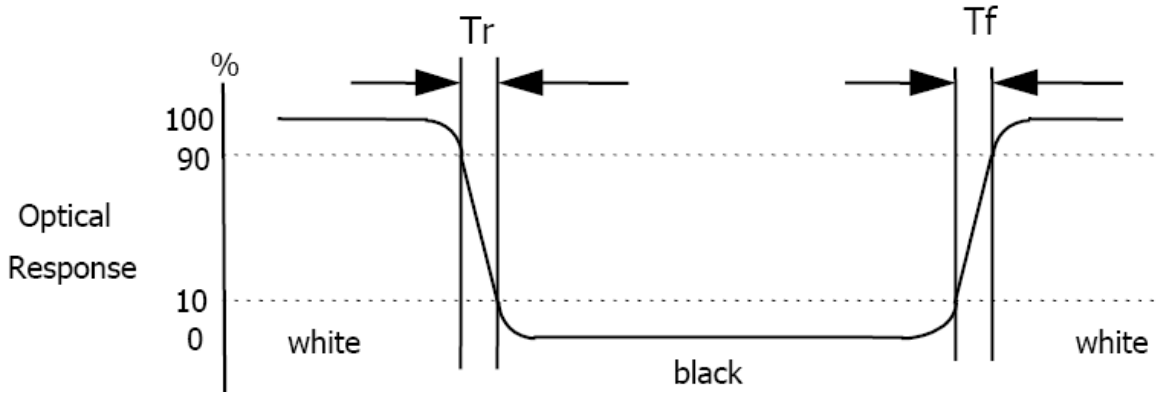


FIG. 3 The definition of Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for “black” and “white”.



* Voltage conditions for Response time
  Vgate: 20V DC
  Vdata: 0V~5V DC
  Vcom: 0V (Ground)

FIG. 4 The definition of viewing angle: <dimension of viewing angle range>

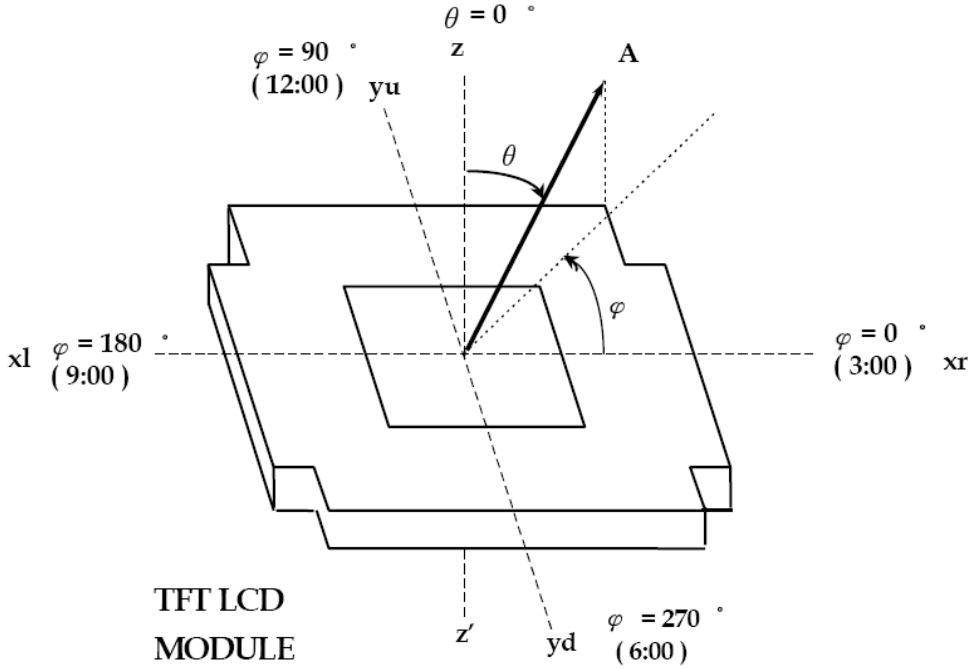
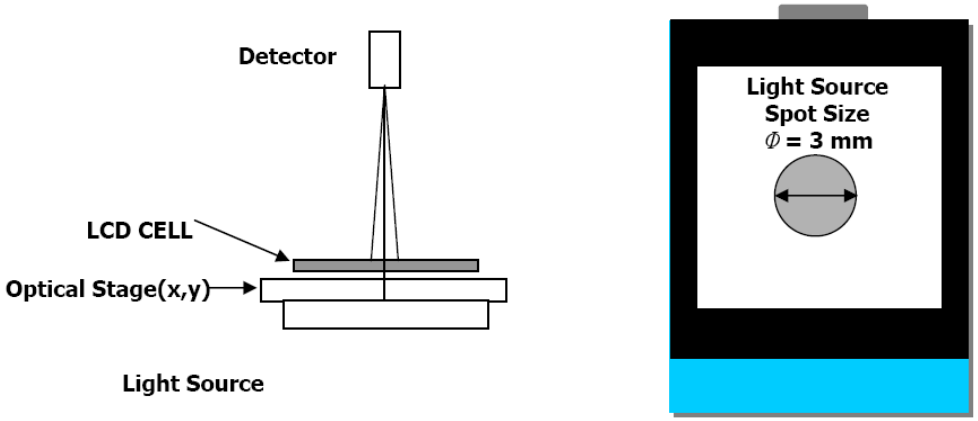


FIG. 5 Response Time Measurement Equipment and Method



11. 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 (30min) ⟺ 25°C (5min) ⟺ 70°C (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.

12. Inspection Standard

This standard apply to C-STN/TFT module

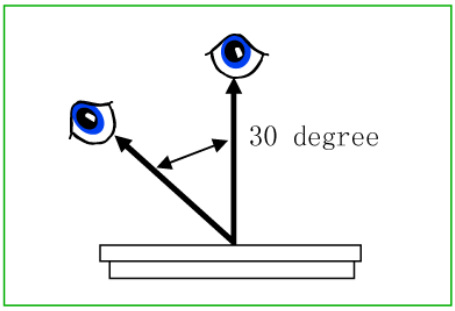
1. **Spot check plan：**

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

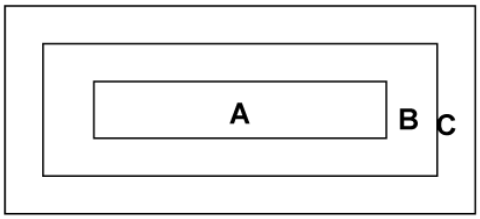
1A：major non-conformance： AQL 0.65 minor non-conformance： AQL 1.

2. **Inspection condition：**



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

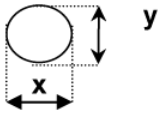
Remark: non-conformance at area C, but is OK that isn’t influence reliability of product & assembly by customer.

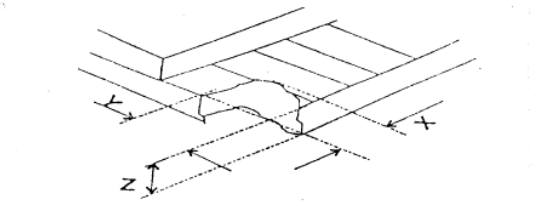
4. Inspection standard

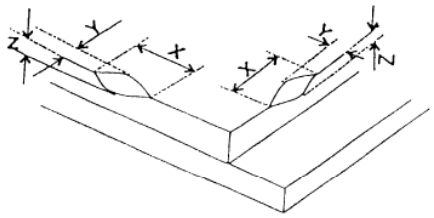
4.1 Major non-conformance

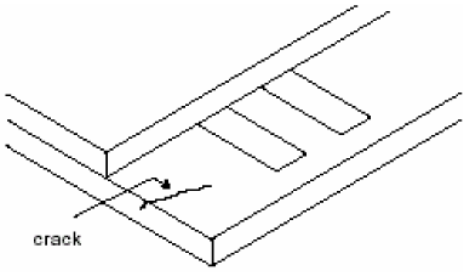
NO.	Item	Inspection standard	Rate
4.1.1	Function non-conformance	1) No display, display abnormally 2) Miss line, short 3) B/L no function or function abnormally 4) TP no function	major
4.1.2	miss	No matter miss what component	
4.1.3	Out of size	Module dimension out of spec	

4.2 Appearance non-conformance

<table>
<tr><th>NO.</th><th>Item</th><th>Inspection standard</th><th>Rate</th></tr>
<tr><td rowspan="2">4.2.1</td><td rowspan="2">Black or white spot（power on）</td><td>dot non-conformance define Φ
$\Phi = \frac{+y)}{2} \quad x \quad ($
 
</td><td rowspan="2">Minor</td></tr>
<tr><td>A grade
<table>
<tr><th rowspan="2">area
size（mm）</th><th colspan="3">Most approve q'ty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.10</td><td colspan="2">ignore</td><td rowspan="5">ignore</td></tr>
<tr><td>0.10＜Φ≤0.15</td><td colspan="2">4</td></tr>
<tr><td>0.15＜Φ≤0.20</td><td colspan="2">2</td></tr>
<tr><td>0.20＜Φ≤0.25</td><td colspan="2">1</td></tr>
<tr><td>0.25＜Φ</td><td colspan="2">0</td></tr>
</table>
Most approve 4 damages, dot to dot ⩾10mm</td></tr>
<tr><td>4.2.2</td><td>Black or white line（power on）</td><td>A grade
<table>
<tr><th colspan="2">Size(mm)</th><th colspan="3">Most approve q'ty</th></tr>
<tr><th>L(length）</th><th>W(width)</th><th>A</th><th>B</th><th>C</th></tr>
<tr><td>ignore</td><td>W≤0.03</td><td colspan="2">ignore</td><td rowspan="4">ignore</td></tr>
<tr><td>L≤5.0</td><td>0.03＜
W≤0.05</td><td colspan="2">3</td></tr>
<tr><td>L≤3.0</td><td>0.05＜
W≤0.07</td><td colspan="2">2</td></tr>
<tr><td></td><td>0.07＜W</td><td colspan="2">Treat with dot non-conformance</td></tr>
</table>
Most approve 3 damages, line to line ⩾10mm</td><td>Minor</td></tr>
</table>

<table>
<tr><td>4.2.3</td><td>Polarizer position</td><td>1) Polarizer attach meet drawing, disallow out of LCD.
2) Polarizer must cover display area（special require unless）</td><td>Minor</td></tr>
<tr><td rowspan="3">4.2.4</td><td rowspan="3">LCD non-conformance</td><td>(i) crash at side（remark: S=ITO length）
 

<table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0</td><td>≤S</td><td>ignore</td></tr></table>Crash disallow extend to ITO or seal.</td><td rowspan="3">Minor</td></tr>
<tr><td>(ii) commonly surface scathe
 

<table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤2.0</td><td><frame edge</td><td>ignore</td></tr></table></td></tr>
<tr><td>(iii) crack
Disallow extend crack
 
</td></tr>
<tr><td>4.2.5</td><td>Contrast voltage warp</td><td>VOP/Vlcd voltage of confirmed sample±0.15V</td><td>Minor</td></tr>
<tr><td>4.2.6</td><td>color</td><td>Color & luminance of module scope reference spec</td><td>Minor</td></tr>
<tr><td>4.2.7</td><td>Cross talk</td><td>Reference confirmed limit sample</td><td>Minor</td></tr>
</table>

13. Handling Precautions

13.1 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.

13.2 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.

13.3 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.

13.4 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

13.5 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.

13.6 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.

13.7 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.

14. Precaution for Use

14.1

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.

14.2

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.

15. Packing Method