



# Specification for Approval

Customer: \_\_\_\_\_

Model Name: \_\_\_\_\_

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



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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

### LCM

TITEM	STANDARD VALUES	UNITS
LCD type	4.3" TFT	--
Dot arrangement	480(RGB)×800	dots
Color filter array	RGB vertical stripe	--
Display mode	IPS / Transmission / Normally Black	-
Gray Scale Inversion Direction	80/80/80/80 deg(U/D/L/R @ C/R>10)	--
Eyes Viewing Direction	ALL	
Driver IC	JD9161	--
Module size	75(W)×120(H)×4.05(T)	mm
Active area	56.16(W)×93.6(H)	mm
Dot pitch	0.117(W)×0.117(H)	mm
Interface	3-wire/4-wire SPI + RGB interface	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	8 White LEDs	--
Weight	TBD	g

### CTP

ITEM	STANDARD VALUES	UNITS
CTP type	Glass LENS + ITO Glass +FPC	--
CTP Driver IC	HY4623-N48	--
Surface hardness	6H	--
Transmittance	≥85%	--
Operation Voltage	2.8V-3.3 V	--
CTP size	75(W)×120 (H)×2.05(T)	mm
CTP Viewing area	57.16(W)×94.70 (H)	mm
CTP Interface	I <sup>2</sup> C	-
Pointing Stick	5	-



## 4. Interface Description

PIN	PIN NAME	DESCRIPTION
1	LEDK	LED backlight (Cathode).
2	LEDA	LED backlight (Anode).
3	GND	Power ground
4	VCI	A supply voltage to the analog circuit.
5	IOVCC	A supply voltage to the logic circuit.
6	GND	Power ground
7	IM1	NOTE 1
8	IM0	
9	SDO	Serial output signal in SPI I/F.
10	SDI	Serial input signal in SPI I/F.
11	SCL	Serial clock input in SPI interface
12	RS	Command address or Command data select in 4-wire SPI interface.
13	/CS	Chip select pin for SPI interface.
14	/RESET	Reset pin.
15-38	DB23-DB00	Display data input in RGB interface. Let it to open in DSI interface mode.
39	ENABLE	Data enable signal in RGB I/F mode
40	DOTCLK	Pixel clock signal in RGB I/F.
41	HSYNC	Horizontal sync signal in RGB I/F.
42	VSYNC	Vertical sync signal in RGB I/F.
43	GND	Power ground
44	CTP-VCC	CTP Digital Power.
45	GND	Power ground
46	CTP-SCL	CTP I <sup>2</sup> C_clock.
47	CTP-SDA	CTP I <sup>2</sup> C_data
48	CTP-IRQ	CTP interruption signal.
49	CTP-REST	CTP reset pin. Active low to enter reset state.
50	GND	Power ground

### NOTE 1

IM1	IM0	Interface mode
1	0	3-wire SPI+RGB
0	1	4-wire SPI+RGB

## 5. Absolute Maximum Ratings

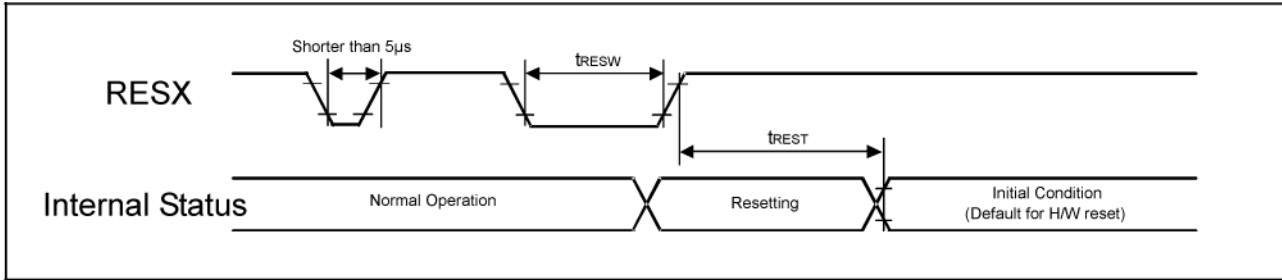
Item	Symbol	Min.	Max.	Unit
Logic Supply Voltage	IOVCC	-0.3	3.6	V
Analog Supply Voltage	VCI	-0.3	3.6	V
CTP Supply Voltage	VCC	-0.3	3.6	V
Input Voltage	V <sub>in</sub>	-0.3	IOVCC+0.3	V
Operating Temperature	T <sub>OP</sub>	-20	70	°C
Storage Temperature	T <sub>ST</sub>	-30	80	°C
Storage Humidity	HD	20	90	%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	2.8	3.0	3.3	V	-
CTP Supply Voltage	VCC	2.8	-	3.3	V	-
Input High Voltage	V <sub>IH</sub>	0.7IOVCC	-	IOVCC	V	-
Input Low Voltage	V <sub>IL</sub>	GND	-	0.3IOVCC	V	-
Output High Voltage	V <sub>OH</sub>	0.8IOVCC	-	IOVCC	V	-
Output Low Voltage	V <sub>OL</sub>	GND	-	0.2IOVCC	V	-
I/O Leak Current	I <sub>LI</sub>	-1	-	1	uA	-

## 7. Timing Characteristics

### 7.1 Reset Timing Characteristics

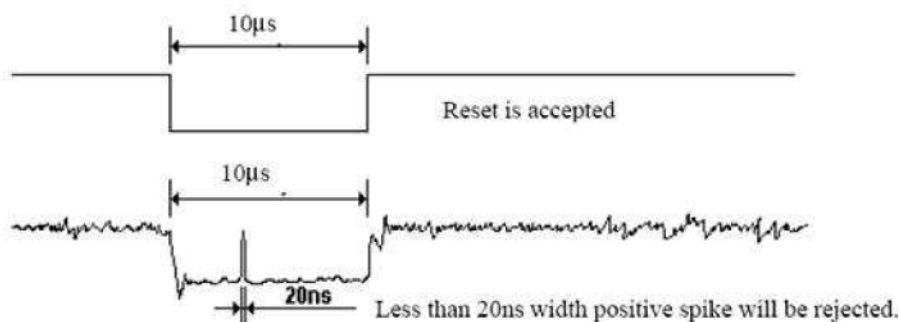


Symbol	Parameter	Related pins	Min.	Typ.	Max.	Note	Unit
$t_{RESW}$	Reset low pulse width <sup>(1)</sup>	RESX	10	-	-	-	$\mu s$
$t_{REST}$	Reset complete time <sup>(2)</sup>	-	5	-	-	When reset is applied during Sleep In mode	ms
		-	120	-	-	When reset is applied during Sleep Out mode	ms

**Note:** (1) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

RESX Pulse	Action
Shorter than 5 $\mu$	Reset Rejected
Longer than 10 $\mu s$	Reset
Between 5 $\mu s$ and 10 $\mu s$	Reset Start

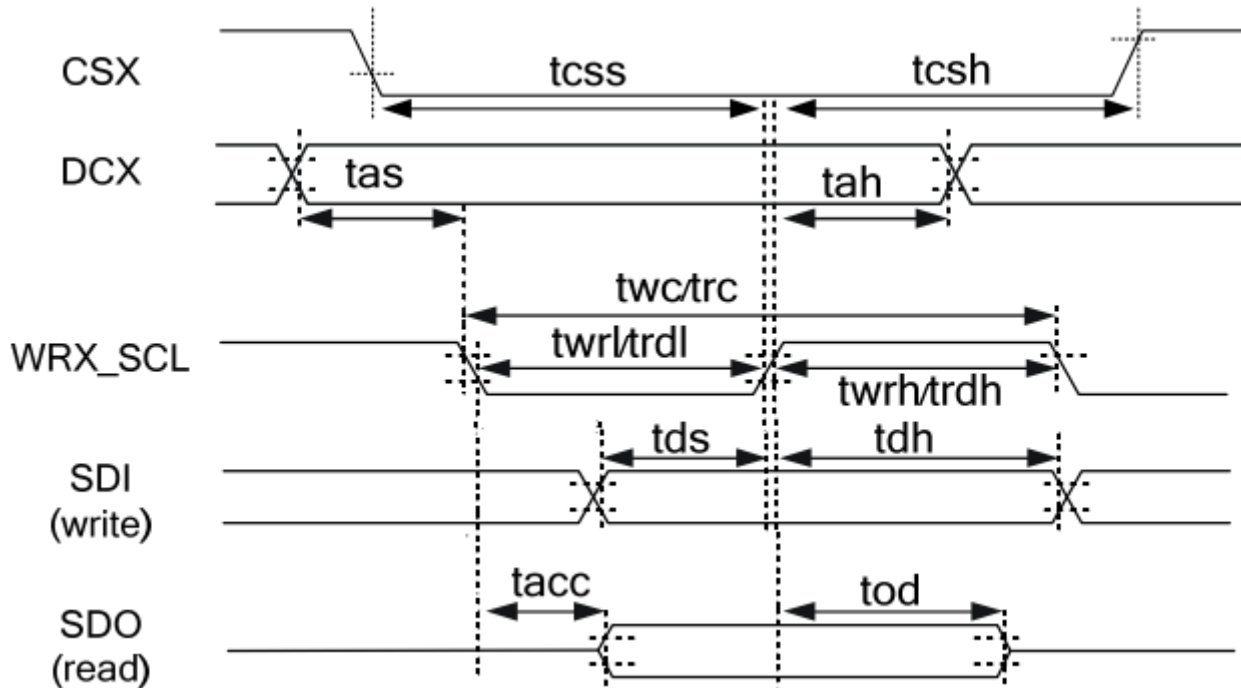
- (2) During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then returns to Default condition for H/W reset.
- (3) During Reset Complete Time, ID2 value in OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time ( $t_{REST}$ ) within 5ms after a rising edge of RESX.
- (4) Spike Rejection also applies during a valid reset pulse as shown below:



- (5) When Reset is applied during Sleep In Mode.
- (6) When Reset is applied during Sleep Out Mode.
- (7) It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.



## 7.2 Display Serial Interface Timing Characteristics (SPI system)



**SPI interface AC characteristics**

( $T_A=25^\circ\text{C}$ ,  $\text{IOVCC}=1.8\text{V}$ ,  $\text{VCIP}=2.8\text{V}$ ,  $\text{VCI}=2.8\text{V}$ )

Signal	Symbol	Parameter	Min.	Max.	Unit	Description
CSX	tcsh	Chip select setup time (Write)	40	-	ns	-
	tcsh	Chip select setup time (Read)	40	-		
DCX	tas	Address setup time	10	-	ns	-
	tah	Address hold time (Write/Read)	10	-		
WRX_SCL (write)	twc	Write cycle	100	-	ns	-
	twrh	Control pulse "H" duration	40	-		
	twrl	Control pulse "L" duration	40	-		
WRX_SCL (read)	trc	Read cycle	150	-	ns	-
	trdh	Control pulse "H" duration	60	-		
	trdl	Control pulse "L" duration	60	-		
SDI/SDO (write)	tds	Data setup time	30	-	ns	Note <sup>(1)</sup>
	tdt	Data hold time	30	-		
SDI/SDO (read)	tacc	Read access time	-	35	ns	
	tod	Output disable time	10	50		

Note: (1) For maximum  $C_L=30\text{pF}$ , for minimum  $C_L=8\text{pF}$ .

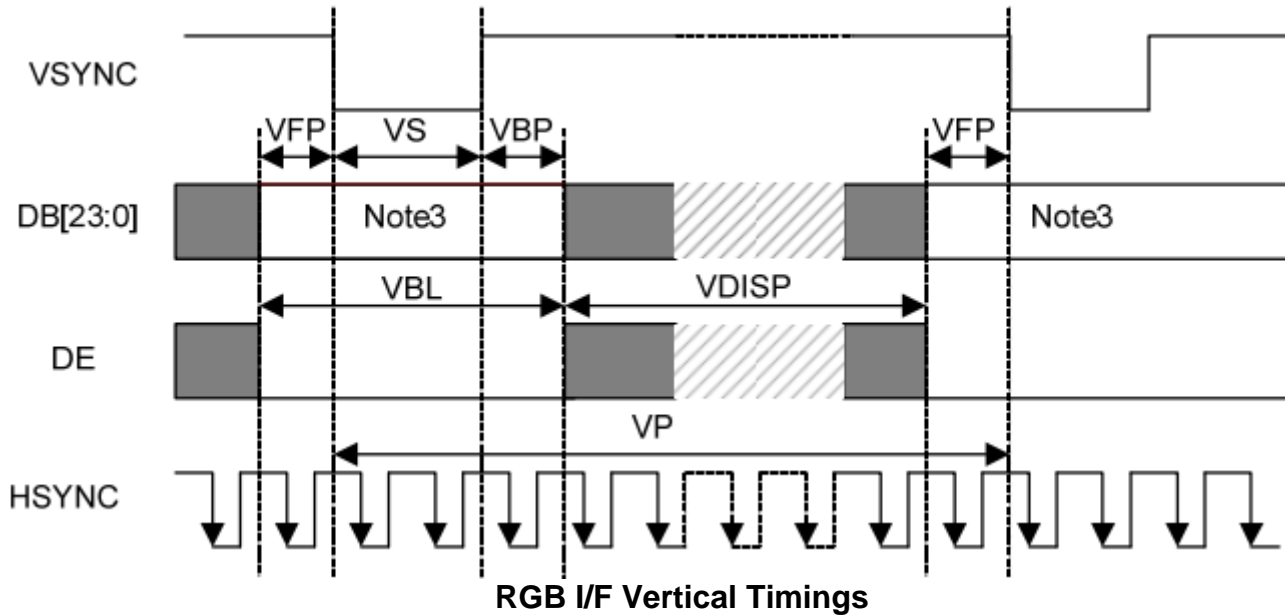
(2) The input signal rise time and fall time ( $t_r$ ,  $t_f$ ) is specified at 15 ns or less.

(3) Logic high and low levels are specified as 30% and 70% of  $\text{IOVCC}$  for Input signals.

**SPI interface AC characteristics**

## 7.3 RGB Interface Timing Characteristics

### 7.3.1 Vertical Timings for RGB I/F



Resolution=480x800(T<sub>A</sub>=25°C, IOVCC=1.8V, VCIP=2.8V, VCI=2.8V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical cycle	VP	-	806	-	-	Line
Vertical low pulse width	VS	-	2	-	Note(4)	Line
Vertical front porch	VFP	-	2	-	-	Line
Vertical back porch	VBP	-	2	-	Note(4)	Line
Vertical data start point	-	VS+VBP	4	-	Note(4)	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	-	Line
Vertical active area	-	VDISP	-	800	-	Line
Vertical Refresh rate	VRR	-	-	60	-	Hz

**Note:** (1) Signal rise and fall times are equal to or less than 10 ns.

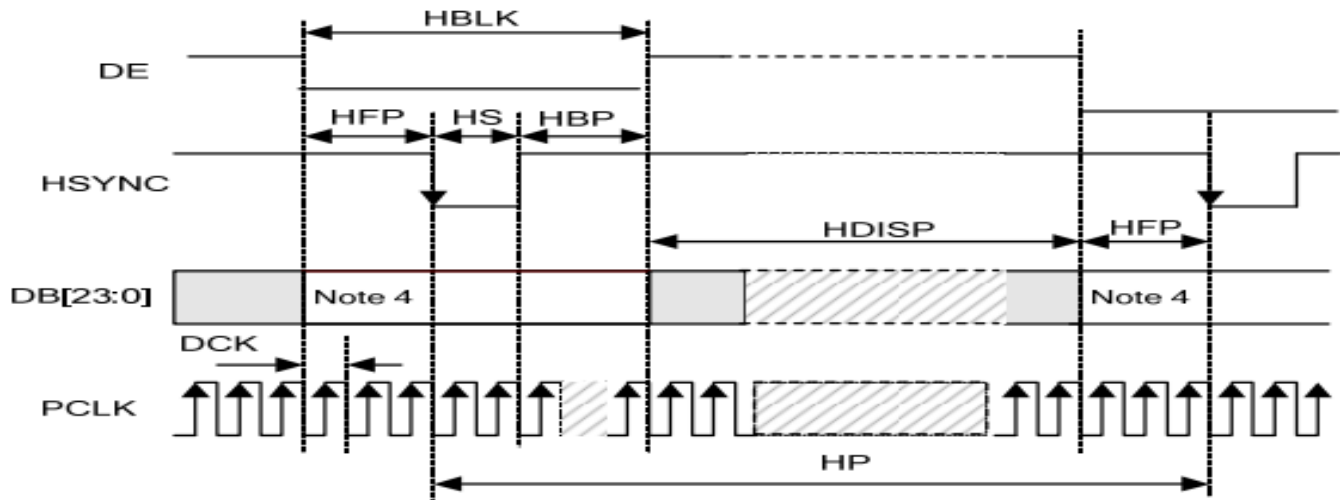
(2) Measuring of input signals are using 0.30 x IOVCC for low state and 0.70 x IOVCC for high state.

(3) Data lines can be set to "High" or "Low" during blanking time – Don't care.

(4) The VS and VBP pulse width are related to GSP and GCK timing. The GSP and GCK must be set at corresponding position for LCD normal display.

### RGB I/F Vertical Timings

### 7.3.2 Horizontal Timings for RGB I/F



**RGB I/F Horizontal Timings**

Resolution=480x800 ( $T_A=25^{\circ}\text{C}$ ,  $\text{IOVCC}=1.8\text{V}$ ,  $\text{VCIP}=2.8\text{V}$ ,  $\text{VCI}=2.8\text{V}$ )

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
HS cycle	HP	Note(3)	496	-	568	DCK
HS low pulse width	HS	-	6	-	78	DCK
Horizontal back porch	HBP	-	5	-	78	DCK
Horizontal front porch	HFP	-	5	-	78	DCK
Horizontal data start point	-	HS+HBP	11	-	83	DCK
Horizontal blanking period	HBLK	HS+HBP+HFP	16	-	88	DCK
Horizontal active area	HDISP	-	-	480	-	DCK
Pixel clock frequency When RGB I/F is running	DCK	VRR = 50 ~ 70 Hz	19.9	-	32.0	MHz

- Note:** (1) Signal rise and fall times are equal to or less than 10 ns.  
 (2) Measuring of input signals are using 0.30 x IOVCC for low state and 0.70 x IOVCC for high state.  
 (3) HP is multiples of eight DCK.  
 (4) Data lines can be set to "High" or "Low" during blanking time – Don't care.

**RGB I/F Horizontal Timings**

## 7.4CTP Timing characteristics

### 7.4.1 IIC communication timing

Test condition : VDD=3.3V,IOVCC=3.3V ,SCL=400kHz, pull high resistance 2.0kΩ

Parameter	Unit	Min	Max
SCL frequency	KHz	--	400
Bus free time between a STOP and START condition	us	1.3	--
Hold time (repeated) START condition	us	0.6	--
Data setup time	ns	100	--
Setup time for a repeated START condition	us	0.6	--
Setup Time for STOP condition	us	0.6	--

### 7.4.2 IIC Slave Address

HY4623 supports 7 bit of slave address, the value of address can be set arbitrary.

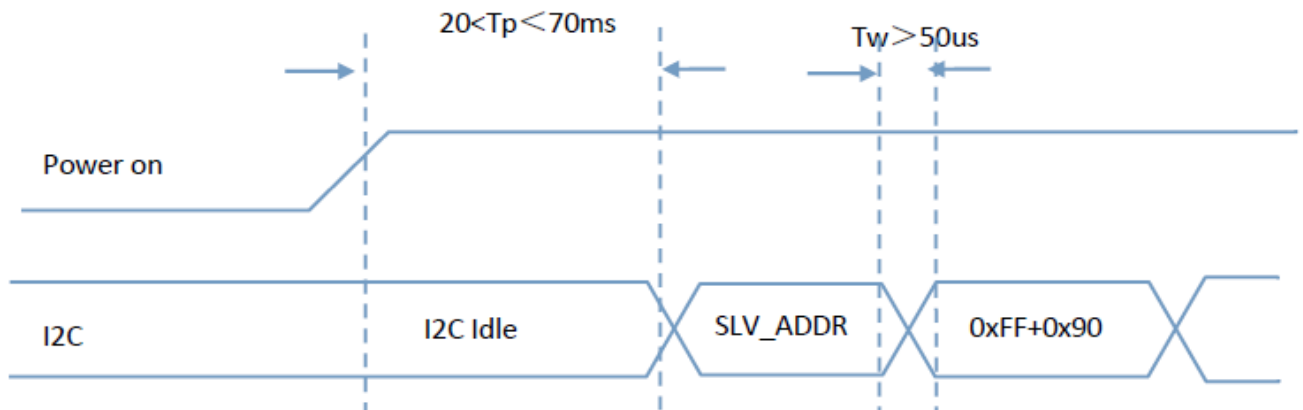
Default slave address: 0x38.

The detailed structure is shown the following figure:

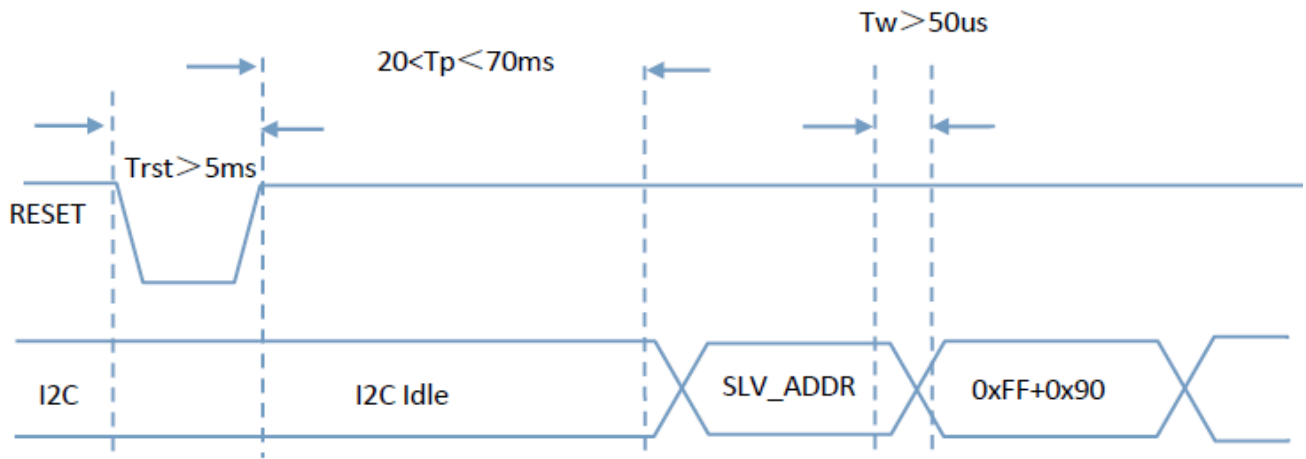
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
I2C Slave Address(7bits)							R/W

### 7.4.3 IIC Timing Chart

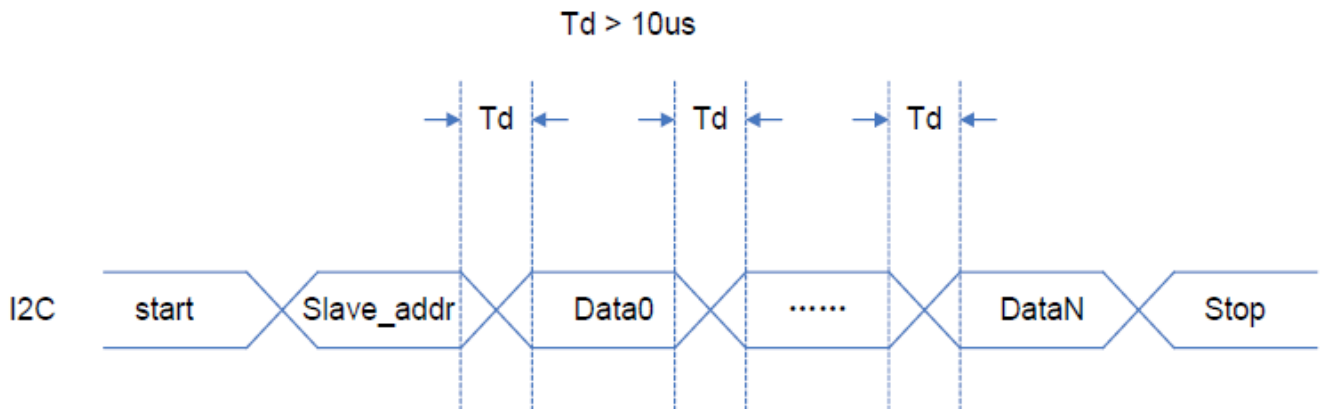
The power on sequence for update requirement :



The RESET time sequence for update requirement:



IIC data transmission chronological chart :



## 8. Backlight Characteristic

LED CIRCUIT:

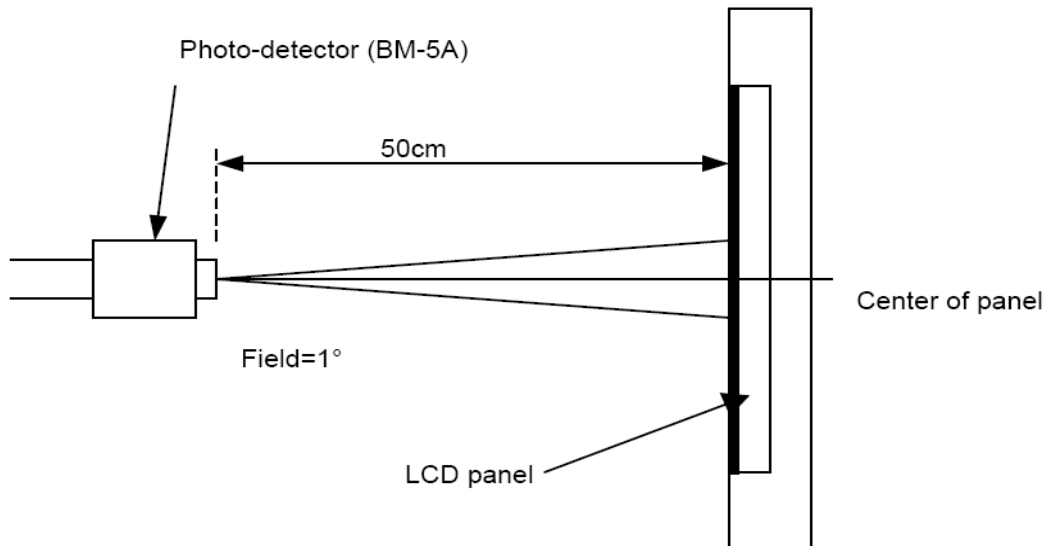


Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	24	25.6	28	V	If=20mA
Supply Current	If	-	20	-	mA	-
Luminous Intensity for LCM	-	250	300	-	cd/m <sup>2</sup>	If=20mA
Uniformity for LCM	-	80	-	-	%	If=20mA
Life Time	-	-	50000	-	Hr	If=20mA
Backlight Color	White					

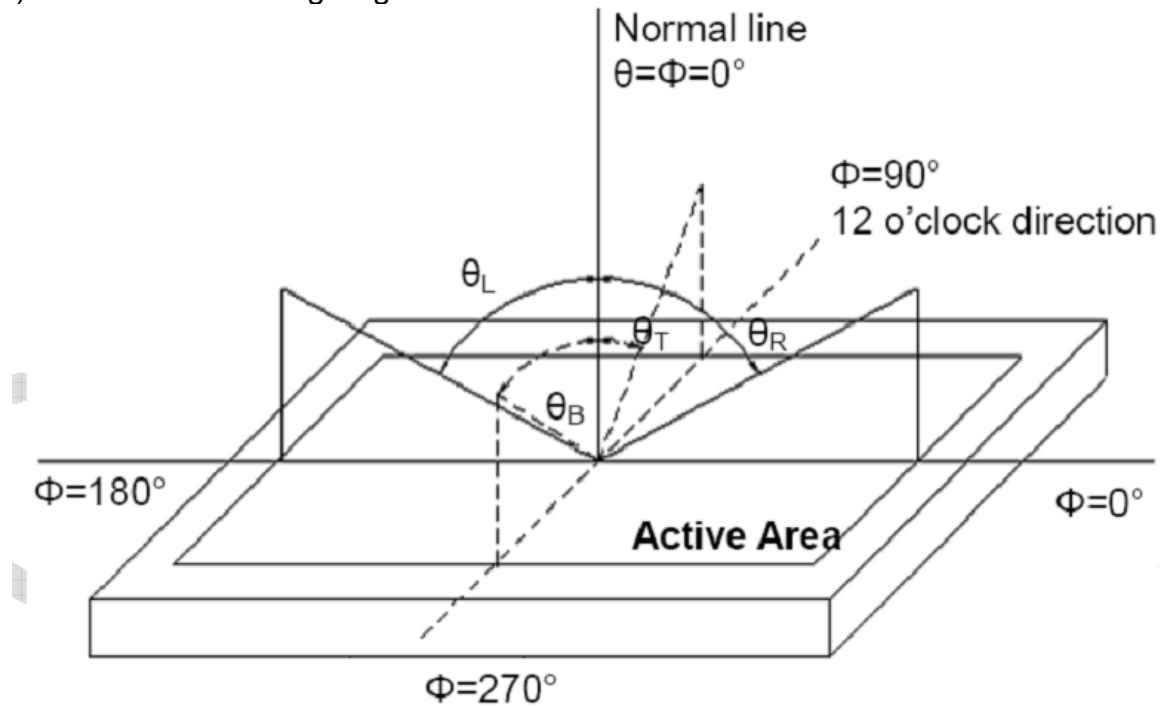
## 9. Optical Characteristics

Item	Conditions	Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	$\theta_L$	70	80	-	degree  (1),(2),(6)
		$\theta_R$	70	80	-	
	Vertical	$\theta_T$	70	80	-	
		$\theta_B$	70	80	-	
Contrast Ratio	Center	650	800	-	-	(1),(3),(6)
Response Time	Rising + Falling	35		40	ms	(1),(4),(6)
CF Color Chromaticity (CIE1931)	Red x	Typ. -0.05	TBD	Typ. +0.05	-	(1), (6)
	Red y		TBD		-	
	Green x		TBD		-	
	Green y		TBD		-	
	Blue x		TBD		-	
	Blue y		TBD		-	
	White x		TBD		-	
	White y		TBD		-	

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



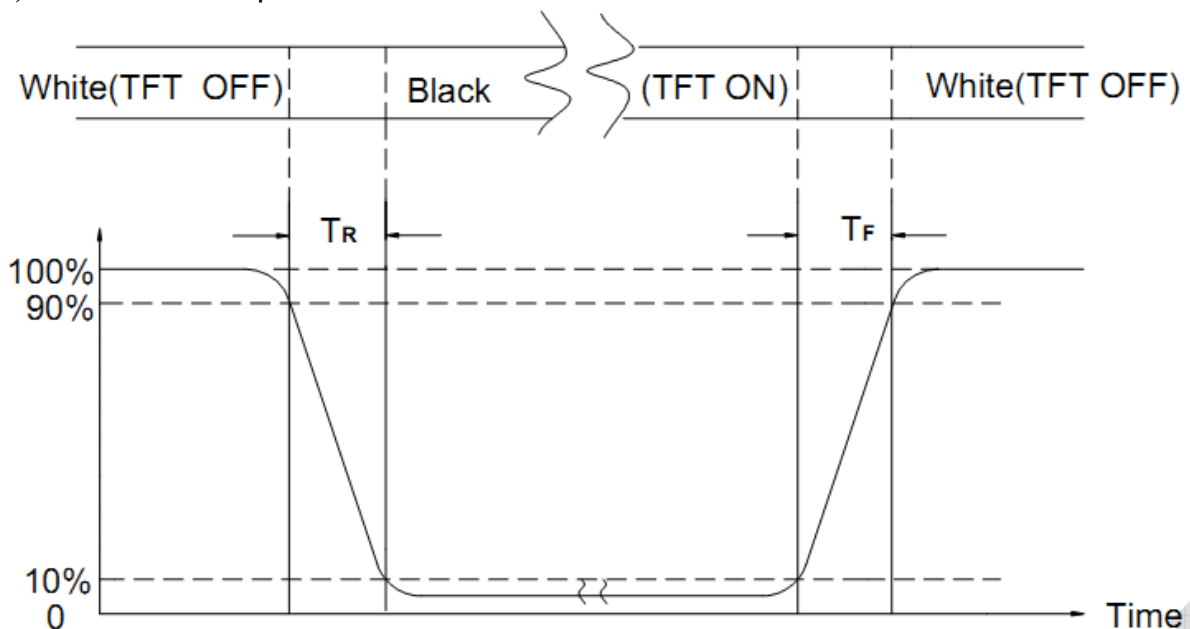
Note (3) Definition Of Contrast Ratio (CR)

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
<input type="checkbox"/>	High Temperature Storage	80°C±2°C×96Hours	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.
<input type="checkbox"/>	Low Temperature Storage	-30°C±2°C×96Hours	
<input type="checkbox"/>	High Temperature Operating	70°C±2°C×96Hours	
<input type="checkbox"/>	Low Temperature Operating	-20°C±2°C×96Hours	
<input type="checkbox"/>	Temperature Cycle(Storage)	-20°C ↔ 25°C ↔ 70°C (30min) ← (5min) → (30min) 1cycle Total 10cycle	
<input type="checkbox"/>	Damp Proof Test (Storage)	50°C±5°C×90%RH×120Hours	
<input type="checkbox"/>	Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5MM X,Y,Z direction for total 3hours (packing condition test will be tested by a carton)	
<input type="checkbox"/>	Drooping Test	Drop to the ground from 1M height one time every side of carton. (packing condition test will be tested by a carton)	
<input type="checkbox"/>	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

### 11.1. QUALITY :

THE QUALITY OF GOODS SUPPLIED TO PURCHASER SHALL COME UP TO THE FOLLOWING STANDARD.

#### 11.1.1. THE METHOD OF PRESERVING GOODS

AFTER DELIVERY OF GOODS FROM AMSON TO PURCHASER. PURCHASER SHALL CONTROL THE LCM AT -10°C TO 40°C ,AND IT MIGHT BE DESIRABLE TO KEEP AT THE NORMAL ROOM TEMPERATURE AND HUMIDITY UNTIL INCOMING INSPECTION OR THROWING INTO PROCESS LINE.

#### 11.1.2. INCOMING INSPECTION

##### (A) THE METHOD OF INSPECTION

IF PURCHASER MAKE AN INCOMING INSPECTION , A SAMPLING PLAN SHALL BE APPLIED ON THE CONDITION THAT QUALITY OF ONE DELIVERY SHALL BE REGARDED AS ONE LOT.

##### (B) THE STANDARD OF QUALITY

ISO-2859-1 (SAME AS MIL-STD-105E ) , LEVEL II SINGLE PLAN.

CLASS	AQL(%)
CRITICAL	0.4 %
MAJOR	0.65 %
MINOR	1.5 %
TOTAL	1.5 %

EVERY ITEM SHALL BE INSPECTED ACCORDING TO THE CLASS.

##### (C) MEASURE

IF AS THE RESULT OF ABOVE RECEIVING INSPECTION , A LOT OUT IS DISCOVERED. PURCHASER SHALL BE INFORM SELLER OF IT WITHIN SEVEN DAYS. BUT FIRST SHIPMENT WITHIN FOURTEEN DAYS.

#### 11.1.3. WARRANTY POLICY

AMSON WILL PROVIDE ONE-YEAR WARRANTY FOR THE PRODUCTS ONLY IF UNDER SPECIFICATION OPERATING CONDITIONS. AMSON WILL REPLACE NEW PRODUCTS FOR THESE DEFECT PRODUCTS WHICH UNDER WARRANTY PERIOD AND BELONG TO THE RESPONSIBILITY OF AMSON.

## 11.2. CHECKING CONDITION

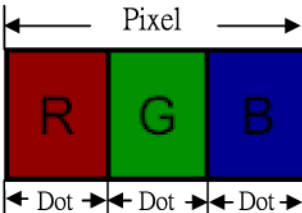
11.2.1. CHECKING DIRECTION SHALL BE IN THE 45 DEGREE AREA TO FACE THE SAMPLE.

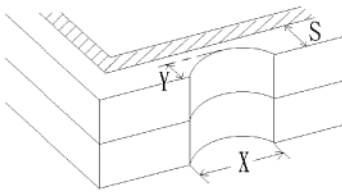
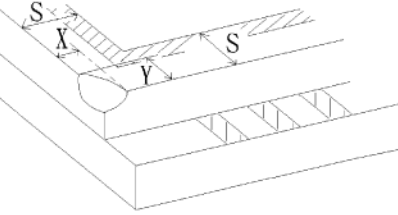
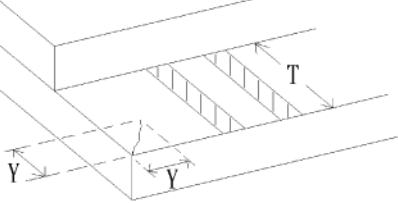
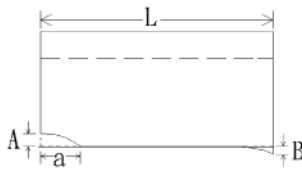
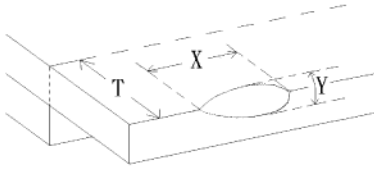
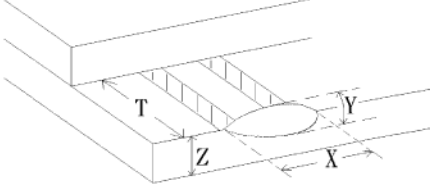
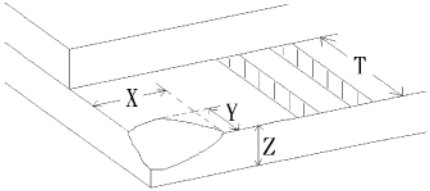
11.2.2. CHECKER SHALL SEE OVER 300±25 mm. WITH BARE EYES FAR FROM SAMPLE AND USING 2 PCS. OF 20W FLUORESCENT LAMP.

### 11.3. INSPECTION PLAN :

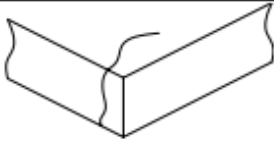
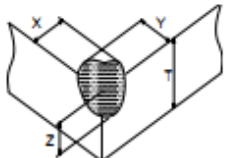
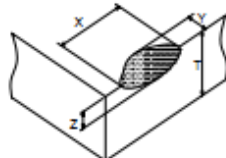
CLASS	ITEM	JUDGEMENT	CLASS
PACKING & INDICATE	1. OUTSIDE AND INSIDE PACKAGE	"MODEL NO." , "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE.	Minor
	2. MODEL MIXED AND QUANTITY	OTHER MODEL MIXED.....REJECTED QUANTITY SHORT OR OVER.....REJECTED	Critical
	3. PRODUCT INDICATION	"MODEL NO." SHOULD INDICATE ON THE PRODUCT	Major
ASSEMBLY	4. DIMENSION, LCD GLASS SCRATCH AND SCRIBE DEFECT.	ACCORDING TO SPECIFICATION OR DRAWING.	Major
APPEARANCE	5. VIEWING AREA	POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREA .....REJECTED	Minor
	6. BLEMISH · BLACK SPOT · WHITE SPOT IN THE LCD AND LCD GLASS CRACKS	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	7. BLEMISH · BLACK SPOT WHITE SPOT AND SCRATCH ON THE POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	8. BUBBLE IN POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	9. LCD'S RAINBOW COLOR	STRONG DEVIATION COLOR ( OR NEWTON RING) OF LCD.....REJECTED. OR ACCORDING TO LIMITED SAMPLE ( IF NEEDED, AND INSIDE VIEWING AREA )	Minor
ELECTRICAL	10. ELECTRICAL AND OPTICAL CHARACTERISTICS ( CONTRAST· VOP · CHROMATICITY ... ETC )	ACCORDING TO SPECIFICATION OR DRAWING . ( INSIDE VIEWING AREA )	Critical
	11.MISSING LINE	MISSING DOT · LINE · CHARACTER .....REJECTED	Critical
	12.SHORT CIRCUIT· WRONG PATTERN DISPLAY	NO DISPLAY · WRONG PATTERN DISPLAY · CURRENT CONSUMPTION OUT OF SPECIFICATION..... REJECTED	Critical
	13. DOT DEFECT (FOR COLOR AND TFT)	ACCORDING TO STANDARD OF VISUAL INSPECTION	Minor

## 11.4. STANDARD OF VISUAL INSPECTION

NO.	CLASS	ITEM	JUDGEMENT																				
11.4.1	MINOR	BLACK AND WHITE SPOT FOREIGN MATERIEL DUST IN THE CELL BLEMISH SCRATCH	<p>(A) ROUND TYPE: <span style="float: right;">unit : mm.</span></p> <table border="1"> <thead> <tr> <th>DIAMETER (mm.)</th> <th>ACCEPTABLE Q'TY</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.1</math></td> <td>DISREGARD</td> </tr> <tr> <td><math>0.1 &lt; \Phi \leq 0.25</math></td> <td>3 (Distance&gt;5mm)</td> </tr> <tr> <td><math>0.25 &lt; \Phi</math></td> <td>0</td> </tr> </tbody> </table> <p>NOTE: <math>\Phi = (\text{LENGTH} + \text{WIDTH}) / 2</math></p> <p>(B) LINEAR TYPE: <span style="float: right;">unit : mm.</span></p> <table border="1"> <thead> <tr> <th>LENGTH</th> <th>WIDTH</th> <th>ACCEPTABLE Q'TY</th> </tr> </thead> <tbody> <tr> <td>-----</td> <td><math>W \leq 0.03</math></td> <td>DISREGARD</td> </tr> <tr> <td><math>L \leq 5.0</math></td> <td><math>0.03 &lt; W \leq 0.07</math></td> <td>3 (Distance&gt;5mm)</td> </tr> <tr> <td>-----</td> <td><math>0.07 &lt; W</math></td> <td>FOLLOW ROUND TYPE</td> </tr> </tbody> </table>	DIAMETER (mm.)	ACCEPTABLE Q'TY	$\Phi \leq 0.1$	DISREGARD	$0.1 < \Phi \leq 0.25$	3 (Distance>5mm)	$0.25 < \Phi$	0	LENGTH	WIDTH	ACCEPTABLE Q'TY	-----	$W \leq 0.03$	DISREGARD	$L \leq 5.0$	$0.03 < W \leq 0.07$	3 (Distance>5mm)	-----	$0.07 < W$	FOLLOW ROUND TYPE
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11.4.2	MINOR	BUBBLE IN POLARIZER DENT ON POLARIZER	<p style="text-align: right;">unit : mm.</p> <table border="1"> <thead> <tr> <th>DIAMETER</th> <th>ACCEPTABLE Q'TY</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.2</math></td> <td>DISREGARD</td> </tr> <tr> <td><math>0.2 &lt; \Phi \leq 0.5</math></td> <td>2 (Distance&gt;5mm)</td> </tr> <tr> <td><math>0.5 &lt; \Phi</math></td> <td>0</td> </tr> </tbody> </table>	DIAMETER	ACCEPTABLE Q'TY	$\Phi \leq 0.2$	DISREGARD	$0.2 < \Phi \leq 0.5$	2 (Distance>5mm)	$0.5 < \Phi$	0												
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11.4.3	MINOR	Dot Defect	<table border="1"> <thead> <tr> <th>Items</th> <th>ACC. Q'TY</th> </tr> </thead> <tbody> <tr> <td>Bright dot</td> <td><math>N \leq 4</math> (Distance&gt;5mm)</td> </tr> <tr> <td>Dark dot</td> <td><math>N \leq 4</math> (Distance&gt;5mm)</td> </tr> </tbody> </table> <p>Pixel Define :</p>  <p>Note 1: The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.</p> <p>Note 2: Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.</p> <p>Note 3: Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue pattern.</p>	Items	ACC. Q'TY	Bright dot	$N \leq 4$ (Distance>5mm)	Dark dot	$N \leq 4$ (Distance>5mm)														
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NO.	CLASS	ITEM	JUDGEMENT
11.4.4	MINOR	LCD GLASS CHIPPING	 $Y > S$ Reject
11.4.5	MINOR	LCD GLASS CHIPPING	 $X \text{ or } Y > S$ Reject
11.4.6	MAJOR	LCD GLASS GLASS CRACK	 $Y > (1/2) T$ Reject
11.4.7	MAJOR	LCD GLASS SCRIBE DEFECT	 <ol style="list-style-type: none"> <li><math>a &gt; L/3</math>, <math>A &gt; 1.5\text{mm}</math>. Reject</li> <li>B: ACCORDING TO DIMENSION</li> </ol>
11.4.8	MINOR	LCD GLASS CHIPPING ( ON THE TERMINAL AREA )	 $\Phi = (x+y)/2 > 2.5 \text{ mm}$ Reject
11.4.9	MINOR	LCD GLASS CHIPPING ( ON THE TERMINAL SURFACE )	 $Y > (1/3) T$ Reject
11.4.10	MINOR	LCD GLASS CHIPPING	 $Y > T$ Reject

## 11.5 INSPECTION STANDARD OF TOUCH PANEL

NO.	CLASS	ITEMS	JUDGEMENT						
11.5.1	MAJOR	Touch Panel Crack	 Reject						
11.5.2	MINOR	Touch Panel Chipping	<div style="display: flex; align-items: center;">  <table border="1" style="margin-left: 20px;"> <tr> <td>Not CNC Products</td> <td><math>X \leq 2\text{mm}, Y \leq 2\text{mm}, Z &lt; 1/2T</math></td> <td>Accept</td> </tr> <tr> <td>CNC Products</td> <td>For CNC Outline Dimension</td> <td>Accept</td> </tr> </table> </div>	Not CNC Products	$X \leq 2\text{mm}, Y \leq 2\text{mm}, Z < 1/2T$	Accept	CNC Products	For CNC Outline Dimension	Accept
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<div style="display: flex; align-items: center;">  <table border="1" style="margin-left: 20px;"> <tr> <td>Not CNC Products</td> <td><math>X \leq 3\text{mm}, Y \leq 3\text{mm}, Z &lt; 1/2T</math></td> <td>Accept</td> </tr> <tr> <td>CNC Products</td> <td>For CNC Outline Dimension</td> <td>Accept</td> </tr> </table> </div>	Not CNC Products	$X \leq 3\text{mm}, Y \leq 3\text{mm}, Z < 1/2T$	Accept	CNC Products	For CNC Outline Dimension	Accept			
Not CNC Products	$X \leq 3\text{mm}, Y \leq 3\text{mm}, Z < 1/2T$	Accept							
CNC Products	For CNC Outline Dimension	Accept							
11.5.3	MINOR	Scratch Dust and Foreign materiel (Linear Type)	$W \leq 0.05, L \leq 10\text{mm}$ Accept						
			$0.05\text{mm} < W \leq 0.07\text{mm} ; L \leq 5.0\text{mm}$ Distance between seratch $> 5.0\text{mm}$ Accept 3 ea Max.						
			$W > 0.07\text{mm}$ Reject						
11.5.4	MINOR	Scratch Dust and Foreign materiel (Round Type : $\Phi = (\text{Length} + \text{Width})/2$ )	$\Phi \leq 0.15\text{mm}$ Accept						
			$0.15\text{mm} < \Phi \leq 0.25\text{mm}$ Distance between seratch $> 5.0\text{mm}$ Accept 5 ea Max.						
			$\Phi > 0.25\text{mm}$ Reject						
11.5.5	MINOR	Touch Panel Dent / Fish Eyes ( $\Phi = (\text{Length} + \text{Width})/2$ )	$\Phi \leq 0.35\text{mm}$ Accept						
			$0.35\text{mm} < \Phi \leq 1.0\text{mm}$ Distance $> 5.0\text{mm}$ Accept 3 ea Max.						
			$\Phi > 1.0\text{mm}$ Reject						
11.5.6	MINOR	Touch Panel Air Bubble ( $\Phi = (\text{Length} + \text{Width})/2$ )	$\Phi \leq 0.15\text{mm}$ Accept						
			$0.15\text{mm} < \Phi \leq 0.25\text{mm}$ Distance between bubbles $> 5.0\text{mm}$ Accept 3 ea Max.						
			$\Phi > 0.25\text{mm}$ Reject						
11.5.7	MINOR	Touch Panel Printing area Scratch	$W \leq 0.03, L \leq 10\text{mm}$ Accept						
			$0.03\text{mm} < W \leq 0.05\text{mm}, L \leq 5\text{mm}$ Accept 3 ea Max.						
			$W > 0.05\text{mm}$ or $L > 5\text{mm}$ ( $W > 0.05$ Follow 8.5.4 Round type ) Reject						
11.5.8	MINOR	Touch Panel White Haze Mark / Dust	Can not be removed Reject						

## 12. Handling Precautions

### 12.1 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.

### 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 (Cl) , Sulfur (S)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

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

### 12.3 Caution against static charge

The LCD module uses C-MOS LSI drivers, so we recommend 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.

### 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 than the limit causes 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 than the operating temperature range and on the other hand at higher temperature LCD's show 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

TBD