

# 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>		



## Table of Contents

List	Description	Page No.
	Cover	1
	Revision Record	2
	Table of Contents	3
1	Scope	4
2	General Information	4
3	External Dimensions	5
4	Interface Description	6
5	Absolute Maximum Ratings	7
6	Electrical Characteristics	8
7	Timing Characteristics	8
8	Backlight Characteristics	13
9	Optical Characteristics	14
10	Reliability Test Conditions and Methods	16
11	Inspection Standard	17
12	Handling Precautions	21
13	Precaution for Use	22
14	Packing Method	22

## 1. Scope

This specification defines general provisions as well as inspection standards for TFT module supplied by AMSON electronics.

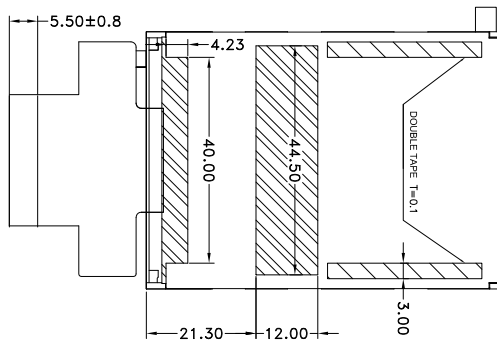
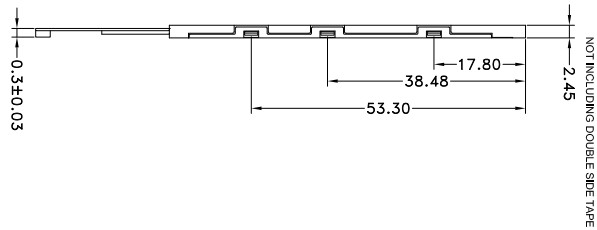
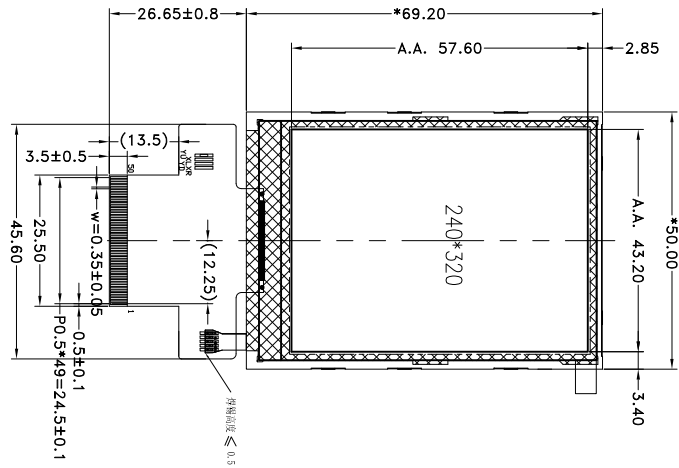
If the event of unforeseen problem or unspecified items may occur, naturally shall negotiate and agree to solution.

## 2. General Information

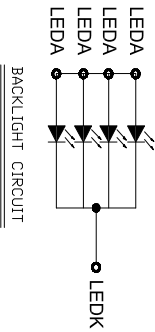
ITEM	STANDARD VALUES	UNITS
LCD type	2.8" TFT	--
Dot arrangement	240(RGB)×320	dots
Color filter array	RGB vertical stripe	--
Display mode	TN / Transmission / Normally White	--
Gray scale inversion Direction	6 o'clock	--
Viewing Direction	12 o'clock	--
Driver IC	ILI9341	--
Module size	50.0(W)×69.2(H)×2.45(T)	mm
Active area	43.2(W)×57.6(H)	mm
Dot pitch	0.18(W)×0.18(H)	mm
Interface	4-lines_8bit / 3-lines_9bit SPI 8-/ 9-/16-/18-bit 8080-series system interface 6-/16-/18-bit RGB interface	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	4 White LED In Parallel	--
Weight	TBD	g

## 3. External Dimensions

**ROHS**



Vf=3.2V If=80mA



TFI	NORMAL WHITE
Display Type	262K COLORS TRANSMISSIVE
VIEWING ANGLE (GRAY)	1200 CLOCK
LCD DRIVE IC	ILI9341V
OPERATION TEMPERATURE	-20°C TO 70°C
STORAGE TEMPERATURE	-30°C TO 80°C
TOLERANCE UNLESS:	±0.2

PIN	SYMBOL
1	LEDK
2	LEDA
3	LEDA
4	LEDA
5	LEDA
6	IM0
7	IM1
8	IM2
9	IM3
10	INRESBT
11	VSYNCG
12	HSYNG
13	DOTCLK
14	ENABLE
15	DI7
16	DI6
17	DI5
18	DI4
19	DI3
20	DI2
21	DI1
22	DI0
23	I9
24	I8
25	I7
26	I6
27	I5
28	I4
29	I3
30	I2
31	I1
32	I0
33	SDI0
34	SDI1_SDA
35	RDX
36	WRX_DI/CX
37	D/CX_SCL
38	CSX
39	TE
40	INDVGC
41	INDVGC
42	VCI
43	GND
44	NC
45	NC
46	NC
47	NC
48	GND
49	GND
50	GND

NO.	DESCRIPTION OF REVISION	REASON	REVISED BY	DATE
1	first issue	A	XG_SU	2017/03/03

		于都上晴电子有限公司 YU DU AMSON ELECTRONICS Co., Ltd.	
TITLE: OUTLINE DIMENSION	D/N: AM240320-028G-X	Rev: A	UNIT: mm
DRAWN BY:	CHECKED BY:	SCALE: 1:1	SHEET NO: 1 OF 1
APPROVED BY:			

## 4. Interface Description

Pin	Symbol	Description.																																																																														
1	LEDK	LED backlight (Cathode).																																																																														
2	LEDA	LED backlight (Anode).																																																																														
3	LEDA	LED backlight (Anode).																																																																														
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5	LEDA	LED backlight (Anode).																																																																														
6	IM0	System interface Mode																																																																														
		<table border="1"> <thead> <tr> <th>IM3</th> <th>IM2</th> <th>IM1</th> <th>IM0</th> <th>Interface mode</th> <th>DB Pin</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>i80-system 8-bit interface I</td> <td>DB[7:0]</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>i80-system 16-bit interface I</td> <td>DB[15:0]</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>0</td> <td>i80-system 9-bit interface I</td> <td>DB[8:0]</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>1</td> <td>i80-system 18-bit interface I</td> <td>DB[17:0]</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>1</td> <td>3-wires_9-bit SPI I</td> <td>CSX,SDA,SCL</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td>0</td> <td>4-wires_8-bit SPI I</td> <td>CSX,RS,SDA,SCL</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>i80-system 16-bit interface II</td> <td>DB[17:10],DB[8:1]</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>1</td> <td>i80-system 8-bit interface II</td> <td>DB[17:10]</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>i80-system 18-bit interface II</td> <td>DB[17:0]</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>1</td> <td>i80-system 9-bit interface II</td> <td>DB[17:9]</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td>1</td> <td>3-wires_9-bit SPI II</td> <td>CSX,SDI,SDO,SCL</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td>0</td> <td>4-wires_8-bit SPI II</td> <td>CSX,D/CX,SDI,SDO,SCL</td> </tr> </tbody> </table>	IM3	IM2	IM1	IM0	Interface mode	DB Pin	0	0	0	0	i80-system 8-bit interface I	DB[7:0]	0	0	0	1	i80-system 16-bit interface I	DB[15:0]	0	0	1	0	i80-system 9-bit interface I	DB[8:0]	0	0	1	1	i80-system 18-bit interface I	DB[17:0]	0	1	0	1	3-wires_9-bit SPI I	CSX,SDA,SCL	0	1	1	0	4-wires_8-bit SPI I	CSX,RS,SDA,SCL	1	0	0	0	i80-system 16-bit interface II	DB[17:10],DB[8:1]	1	0	0	1	i80-system 8-bit interface II	DB[17:10]	1	0	1	0	i80-system 18-bit interface II	DB[17:0]	1	0	1	1	i80-system 9-bit interface II	DB[17:9]	1	1	0	1	3-wires_9-bit SPI II	CSX,SDI,SDO,SCL	1	1	1	0	4-wires_8-bit SPI II	CSX,D/CX,SDI,SDO,SCL
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7	IM1																																																																															
8	IM2																																																																															
9	IM3																																																																															
10	NRESET	Reset input pin, Active "L".																																																																														
11	VSYNC	Vertical sync signal in RGB I/F.																																																																														
12	HSYNC	Horizontal sync signal in RGB I/F.																																																																														
13	DOTCLK	Pixel clock signal in RGB I/F.																																																																														
14	ENABLE	Data enable signal in RGB I/F mode																																																																														
15	D17	<p>18-bit parallel bi-directional data bus for MPU- I system:            8-bit I/F: DB [7:0] is used.            9-bit I/F: DB [8:0] is used.            16-bit I/F: DB [15:10] is used.            18-bit I/F: DB [17:0] is used.</p> <p>18-bit parallel bi-directional data bus for MPU- II system:            8-bit I/F: DB [17:10] is used.            9-bit I/F: DB [17:9] is used.            16-bit I/F: DB [17:10] and DB [8:1] is used.            18-bit I/F: DB [17:0] is used.</p> <p>18-bit input data bus for RGB I/F.            6-bit/pixel: DB[5:0] is used;            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];</p> Connect unused pins to GND.																																																																														
16	D16																																																																															
17	D15																																																																															
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32	D0																																																																															

33	SDO	Serial output signal in SPI I/F.
34	SDI_SDA	Serial input signal in SPI I/F.
35	RDX	Reads strobe signal to write data when RDX is “Low” in MPU interface.
36	WRX_D/CX	MCU: Serves as a write signal and writes data at the rising edge. 4-line SPI: Serves as command or parameter select.
37	D/CX_SCL	Display data / command selection in 80-series MPU I/F. D/CX =”0”: Command      D/CX =”1”: Display data. SPI: This pin is used serial interface clock in SPI.
38	CSX	Chip select input pin (“Low” enable) in MPU I/F and SPI I/F.
39	TE	Tearing effect output pin to synchronize MPU to frame writing.
40	IOVCC	I/O power supply.
41	IOVCC	I/O power supply.
42	VCI	System power supply.
43	GND	Power ground
44	NC	No connection
45	NC	
46	NC	
47	NC	
48	GND	Power ground
49	GND	Power ground
50	GND	Power ground

## 5. Absolute Maximum Ratings

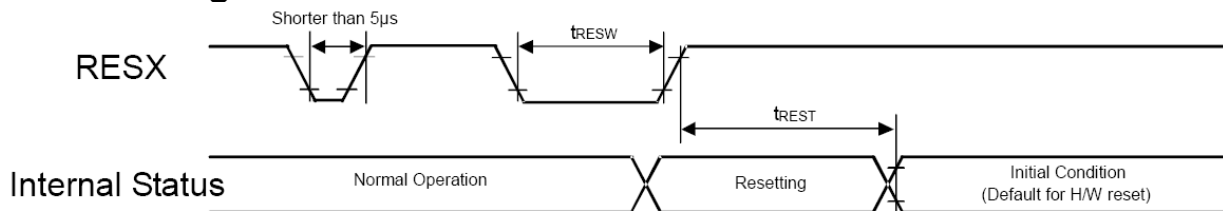
Item	Symbol	Min.	Max.	Unit
Logic Supply Voltage	IOVCC	-0.3	4.6	V
Analog Supply Voltage	VCI	-0.3	4.6	V
Input Voltage	Vin	-0.3	IOVCC+0.3	V
Operating Temperature	TOP	-20	70	°C
Storage Temperature	TST	-30	80	°C
Storage Humidity	HD	20	90	%RH

## 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 <sub>IH</sub>	0.7IOVCC	-	IOVCC	V	Digital input pins
Input Low Voltage	V <sub>IL</sub>	GND	-	0.3IOVCC	V	Digital input pins
Output High Voltage	V <sub>OH</sub>	0.8IOVCC	-	IOVCC	V	Digital output pins
Output Low Voltage	V <sub>OL</sub>	GND	-	0.2IOVCC	V	Digital output pins
I/O Leak Current	I <sub>LI</sub>	-0.1	-	0.1	uA	-

## 7. Timing Characteristics

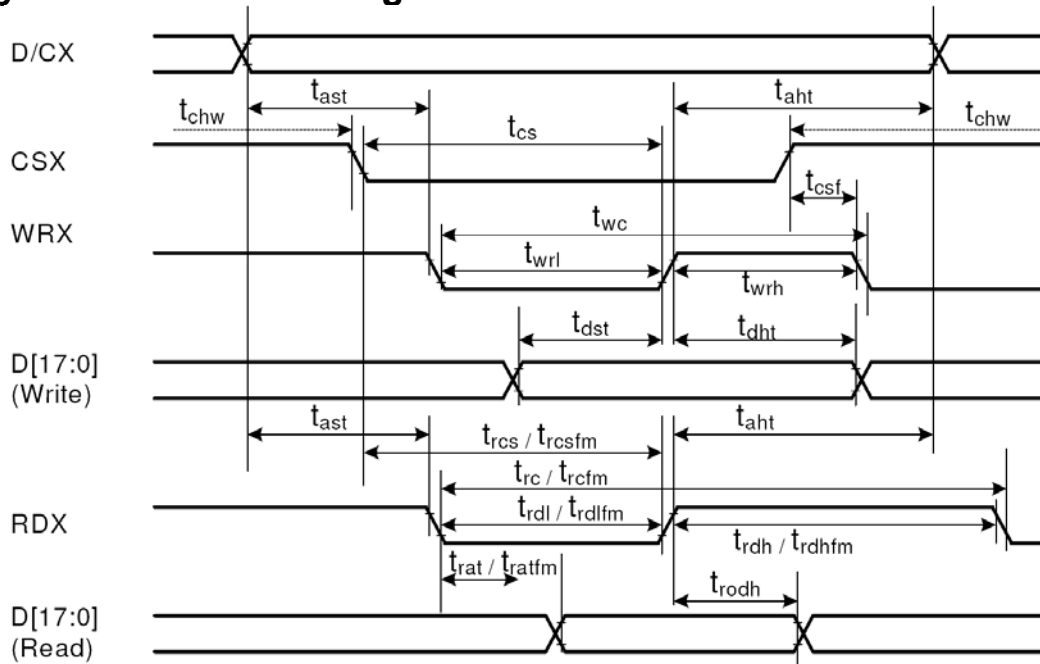
### 7.1 Reset Timing Characteristics



Symbol	Parameter	Related pins	Min.	Typ.	Max.	Note	Unit
t <sub>RESW</sub>	Reset low pulse width <sup>(1)</sup>	RESX	10	-	-	-	µs
t <sub>REST</sub>	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

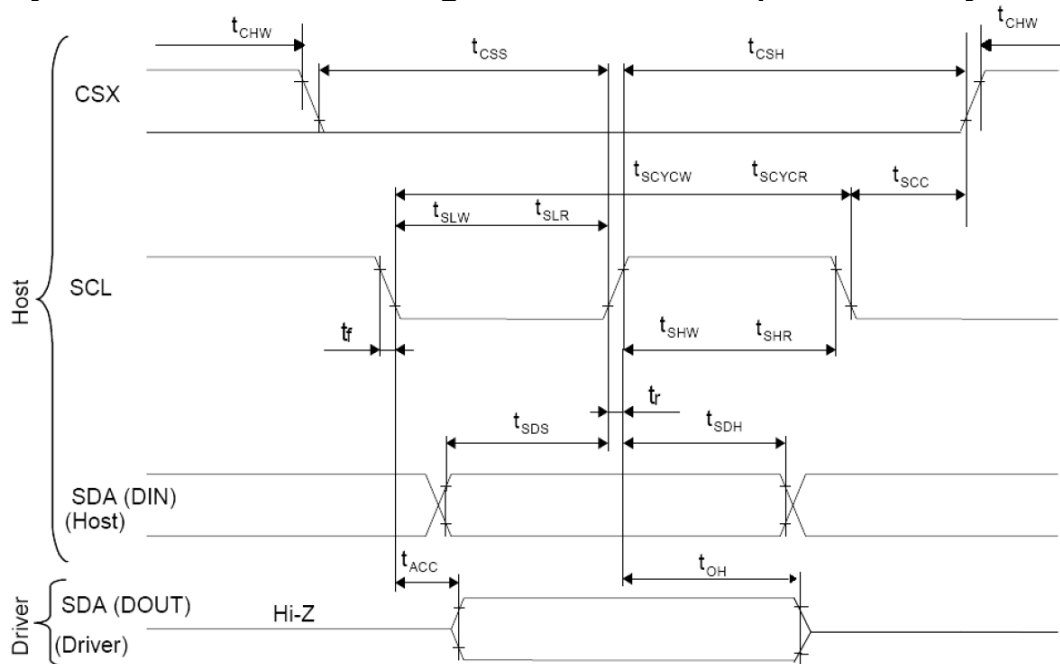


## 7.2 i80-System Interface Timing Characteristics



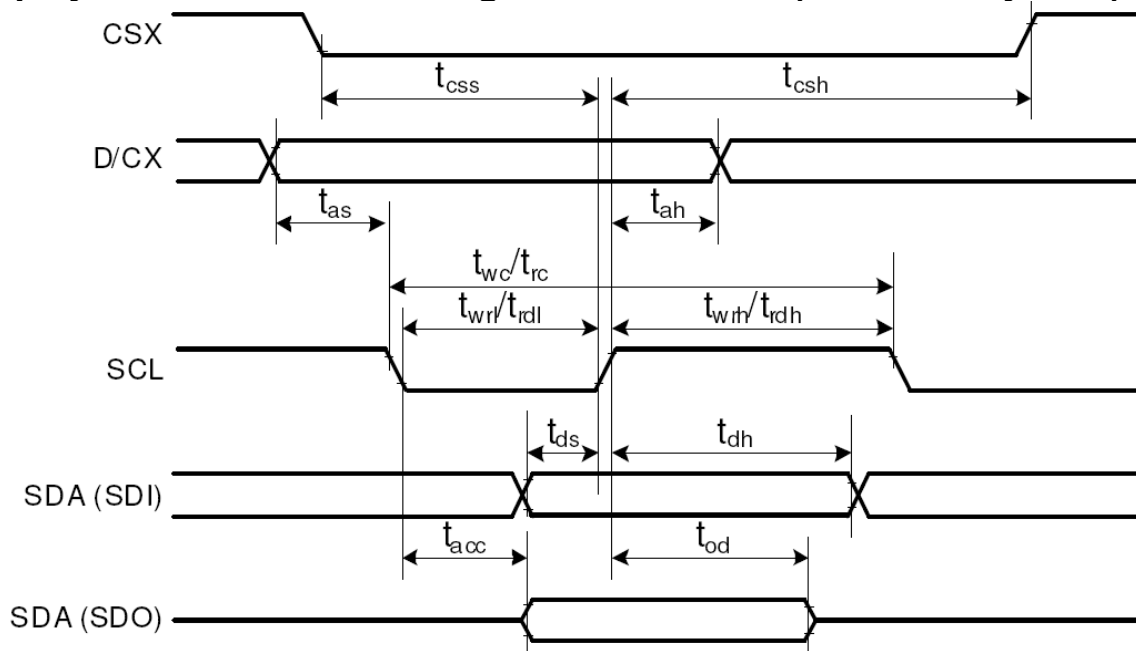
Signal	Symbol	Parameter	min	max	Unit	Description
DCX	$t_{ast}$	Address setup time	0	-	ns	
	$t_{ah}$	Address hold time (Write/Read)	0	-	ns	
CSX	$t_{chw}$	CSX "H" pulse width	0	-	ns	
	$t_{cs}$	Chip Select setup time (Write)	15	-	ns	
	$t_{rcs}$	Chip Select setup time (Read ID)	45	-	ns	
	$t_{rcsfm}$	Chip 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	15	-	ns	
	$t_{wrl}$	Write Control pulse L duration	15	-	ns	
RDX (FM)	$t_{rcfm}$	Read Cycle (FM)	450	-	ns	
	$t_{rdhfm}$	Read Control H duration (FM)	90	-	ns	
	$t_{rdlfm}$	Read Control L duration (FM)	355	-	ns	
RDX (ID)	$t_{rc}$	Read cycle (ID)	160	-	ns	
	$t_{rdh}$	Read Control pulse H duration	90	-	ns	
	$t_{rdl}$	Read Control pulse L duration	45	-	ns	
D[17:0], D[17:10]&D[8:1], D[17:10], D[17:9]	$t_{dst}$	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 (FM)	-	340	ns	
	$t_{rodh}$	Read output disable time	20	80	ns	

## 7.3 Display Serial Interface Timing Characteristics (3-line SPI system)



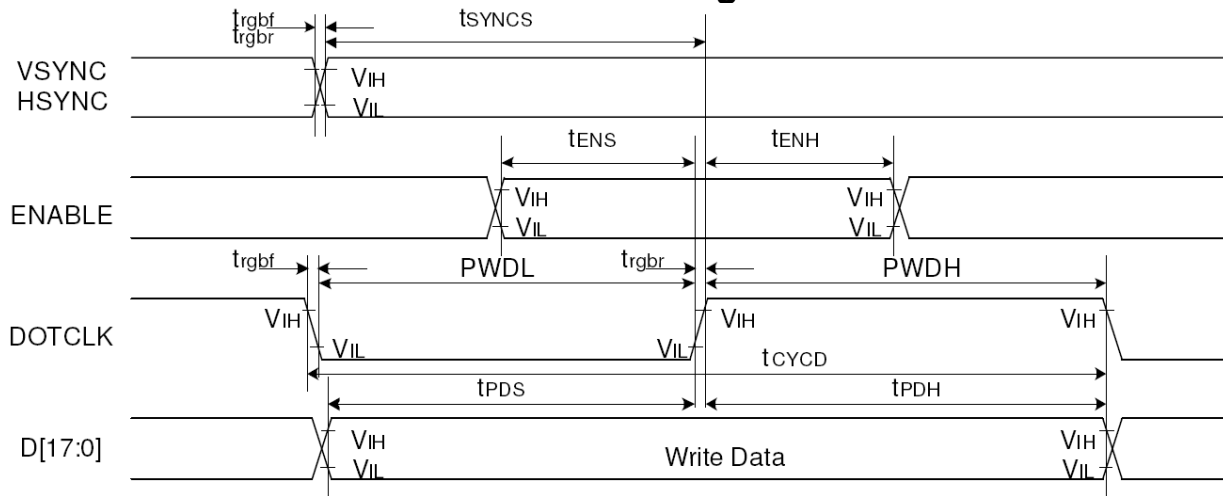
Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscyww	Serial Clock Cycle (Write)	100	-	ns	
	tshw	SCL "H" Pulse Width (Write)	40	-	ns	
	tslw	SCL "L" Pulse Width (Write)	40	-	ns	
	tscywr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	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	tscw	SCL-CSX	20	-	ns	
	tchw	CSX "H" Pulse Width	40	-	ns	
	tcss	CSX-SCL Time	60	-	ns	
	tcsr		65	-	ns	

## 7.4 Display Serial Interface Timing Characteristics (4-line SPI system)



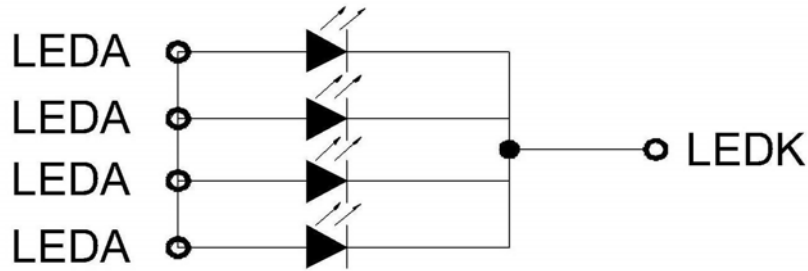
Signal	Symbol	Parameter	min	max	Unit	Description
CSX	$t_{css}$	Chip select time (Write)	40	-	ns	
	$t_{csh}$	Chip select hold time (Read)	40	-	ns	
SCL	$t_{wc}$	Serial clock cycle (Write)	100	-	ns	
	$t_{wrh}$	SCL "H" pulse width (Write)	40	-	ns	
	$t_{wrl}$	SCL "L" pulse width (Write)	40	-	ns	
	$t_{rc}$	Serial clock cycle (Read)	150	-	ns	
	$t_{rdh}$	SCL "H" pulse width (Read)	60	-	ns	
	$t_{rdl}$	SCL "L" pulse width (Read)	60	-	ns	
D/CX	$t_{as}$	D/CX setup time	10	-		
	$t_{ah}$	D/CX hold time (Write / Read)	10	-		
SDA / SDI (Input)	$t_{ds}$	Data setup time (Write)	30	-	ns	
	$t_{dh}$	Data hold time (Write)	30	-	ns	
SDA / SDO (Output)	$t_{acc}$	Access time (Read)	10	-	ns	For maximum CL=30pF
	$t_{od}$	Output disable time (Read)	10	50	ns	For minimum CL=8pF

## 7.5 Parallel 24/18/16-bit RGB Interface Timing Characteristics



Signal	Symbol	Parameter	min	max	Unit	Description	
VSYNC / HSYNC	$t_{SYNCS}$	VSYNC/HSYNC setup time	15	-	ns	18/16-bit bus RGB interface mode	
	$t_{SYNCH}$	VSYNC/HSYNC hold time	15	-	ns		
DE	$t_{ENL}$	DE setup time	15	-	ns		
	$t_{ENH}$	DE hold time	15	-	ns		
D[17:0]	$t_{POS}$	Data setup time	15	-	ns		
	$t_{PDH}$	Data hold time	15	-	ns		
DOTCLK	PWDH	DOTCLK high-level period	15	-	ns		
	PWDL	DOTCLK low-level period	15	-	ns		
	$t_{CYCD}$	DOTCLK cycle time	100	-	ns		
	$t_{rgbr}, t_{rgbf}$	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns		
VSYNC / HSYNC	$t_{SYNCS}$	VSYNC/HSYNC setup time	15	-	ns		6-bit bus RGB interface mode
	$t_{SYNCH}$	VSYNC/HSYNC hold time	15	-	ns		
DE	$t_{ENL}$	DE setup time	15	-	ns		
	$t_{ENH}$	DE hold time	15	-	ns		
D[17:0]	$t_{POS}$	Data setup time	15	-	ns		
	$t_{PDH}$	Data hold time	15	-	ns		
DOTCLK	PWDH	DOTCLK high-level pulse period	15	-	ns		
	PWDL	DOTCLK low-level pulse period	15	-	ns		
	$t_{CYCD}$	DOTCLK cycle time	100	-	ns		
	$t_{rgbr}, t_{rgbf}$	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns		

8. Backlight Characteristics



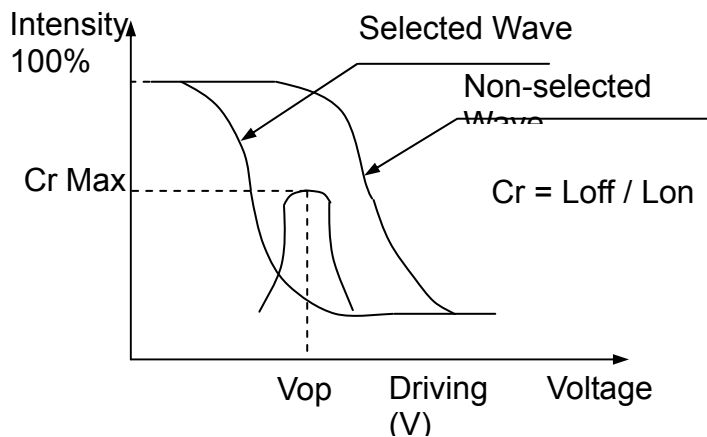
BACKLIGHT CIRCUIT

Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	2.9	3.2	3.5	V	If=80mA
Supply Current	If	--	80	--	mA	--
Luminous Intensity for LCM	--	200	300	--	Cd/m <sup>2</sup>	If=80mA
Uniformity for LCM	--	80	--	--	%	If=80mA
Life Time	--	20000	--	--	Hr	If=80mA
Backlight Color	White					

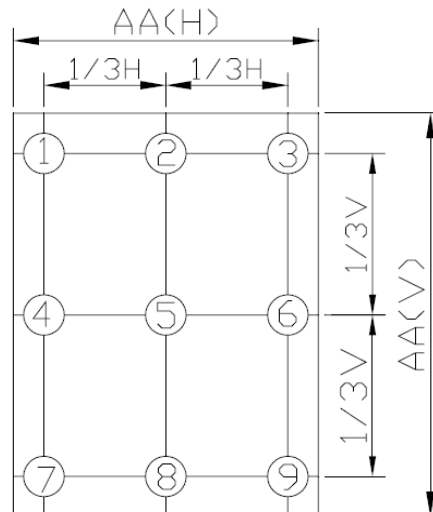
## 9. Optical Characteristics

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK	
Brightness	BL	$\theta = \varphi = 0^\circ$	200	300	--	cd/m <sup>2</sup>	Note2	
Contrast Ratio	CR	$\theta = \varphi = 0^\circ$	--	300	--	--	Note3	
Response Time	Tr+ Tf	$\theta = \varphi = 0^\circ$	--	30	--	ms	Note4	
Viewing Angle	Upper	$\theta$	$CR \geq 10$	--	45	--	--	Note 5
	Down			--	20	--	--	
	Right	$\varphi$		--	45	--	--	
	Left			--	45	--	--	
Color Filter Chromaticity	White	X y	$\theta = \varphi = 0^\circ$	Typ. -0.059	0.297	Typ. +0.05	--	Note 6
					0.327		--	
	Red	X y	$\theta = \varphi = 0^\circ$		0.631		--	
					0.316		--	
	Green	X y	$\theta = \varphi = 0^\circ$		0.298		--	
					0.566		--	
	Blue	X y	$\theta = \varphi = 0^\circ$		0.138		--	
					0.122		--	

Note1: Definition of Operation Voltage (Vop)



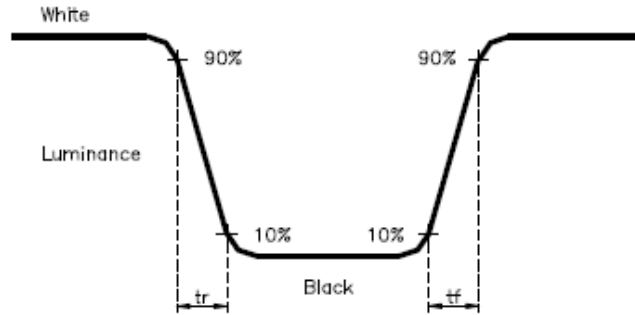
Note2: Definition of Luminance Uniformity :  $L = L(MIN) / L (MAX) \times 100\%$



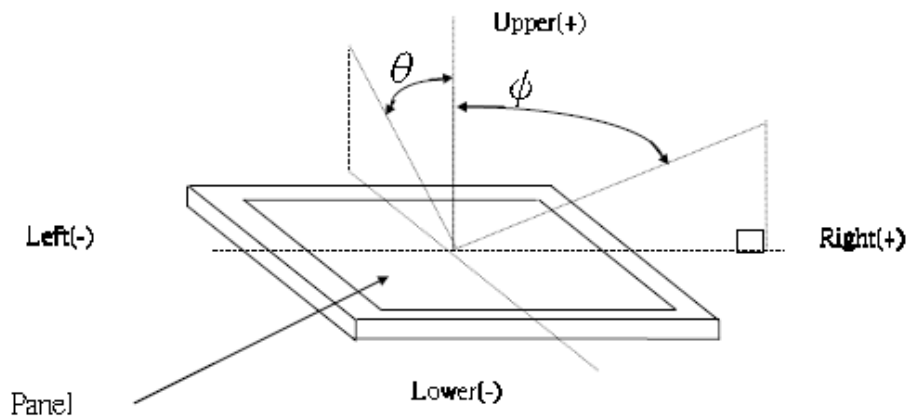
Note 3. Definition of Contrast Ratio:

$$CR = \text{White Luminance (ON)} / \text{Black Luminance (OFF)}$$

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( $\theta$  ,  $\psi$ ) :



Note 6. Light source: C light.

## 10. Reliability Test Conditions and Methods

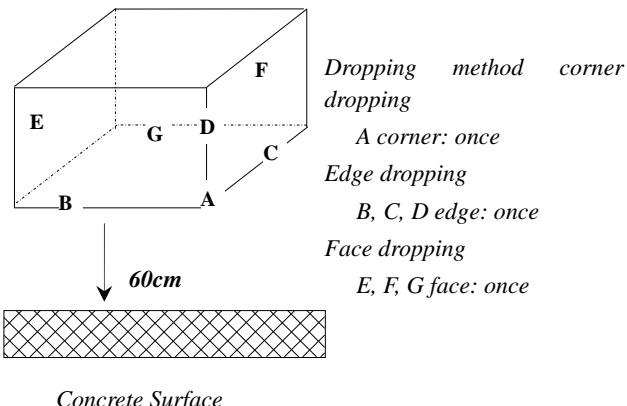
No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.

Temperature:  $20 \pm 5^\circ\text{C}$

Humidity:  $65 \pm 5\% \text{RH}$

Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Operating Temperature	$70^\circ\text{C} \pm 2^\circ\text{C}$ , 240hrs (Operation state)	--
2	Low Operating Temperature	$-20^\circ\text{C} \pm 2^\circ\text{C}$ , 240hrs (Operation state)	--
3	High Storage Temperature	$80^\circ\text{C} \pm 2^\circ\text{C}$ , 240hrs	--
4	Low Storage Temperature	$-30^\circ\text{C} \pm 2^\circ\text{C}$ , 240hrs	--
5	High Temperature and High Humidity Operation Test	$60^\circ\text{C} \pm 2^\circ\text{C}$ , 90%, 240hrs	--
6	Vibration Test	Total fixed amplitude: 1.5mm Vibration Frequency: 10~55Hz One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.	--
7.	Drop Test	<p>To be measured after dropping from 60cm high on the concrete surface in packing state.</p>  <p><i>Dropping method corner dropping</i>  <i>A corner: once</i>  <i>Edge dropping</i>  <i>B, C, D edge: once</i>  <i>Face dropping</i>  <i>E, F, G face: once</i></p> <p><i>Concrete Surface</i></p>	--

- Notes:
1. No dew condensation to be observed.
  2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
  3. Vibration test will be conducted to the product itself without putting I in a container.



## 11. Inspection Standard

### 11.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

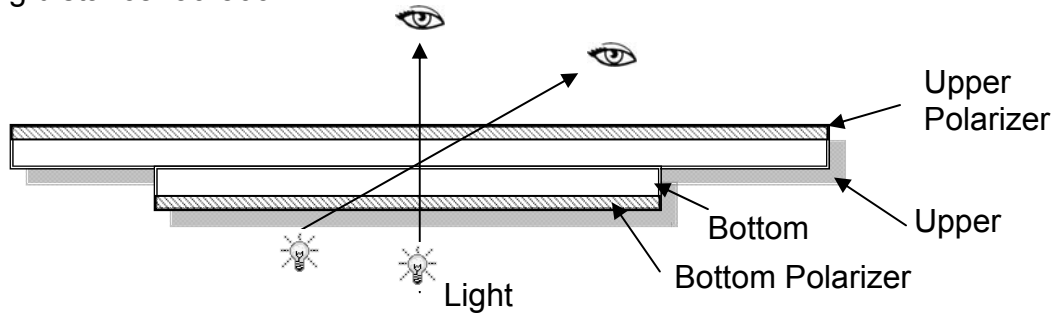
Temperature: 25±5°C

Humidity: 65%±10%RH

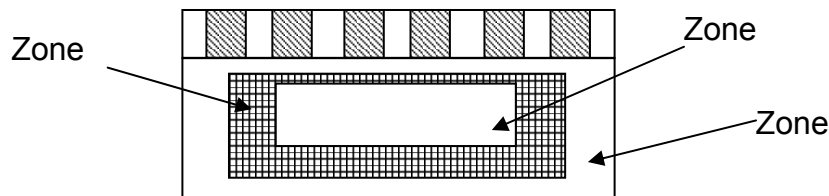
Viewing Angle: Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance: 30-50cm



### 11.1.2 Definition



Zone A: Effective Viewing Area (Character or Digit can be seen)

Zone B: Viewing Area except Zone A

Zone C: Outside (Zone A + Zone B) which cannot be seen after assembly by customer.)

Note:

As a general rule, visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer.

### 11.1.3 Sampling Plan

According to GB/T 2828-2003; normal inspection, Class II

AQL:

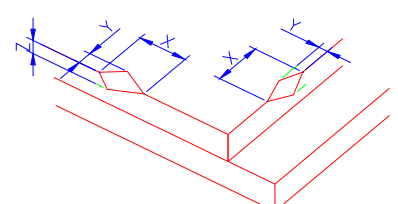
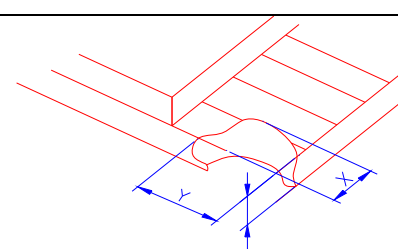
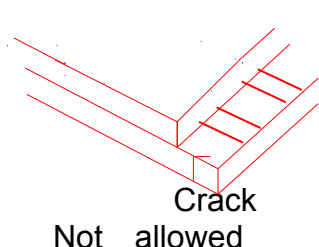
Major defect	Minor defect
0.65	1.5

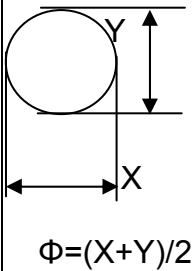
LCD: Liquid Crystal Display, TP: Touch Panel, LCM: Liquid Crystal Module

No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	

4	Color tone	Color unevenness, refer to limited sample	Minor
5	Soldering appearance	Good soldering, Peeling off is not allowed.	
6	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	

### 11.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack / Broken  NOTE: X: Length Y: Width Z: Height L: Length of ITO, T: Height of LCD	(1) The edge of LCD broken	 <table border="1" style="margin-top: 10px;"> <tr> <td style="text-align: center;">X</td> <td style="text-align: center;">Y</td> <td style="text-align: center;">Z</td> </tr> <tr> <td style="text-align: center;"><math>\leq 3.0\text{mm}</math></td> <td style="text-align: center;">&lt;Inner border line of the seal</td> <td style="text-align: center;"><math>\leq T</math></td> </tr> </table>	X	Y	Z	$\leq 3.0\text{mm}$	<Inner border line of the seal	$\leq T$
	X	Y	Z					
	$\leq 3.0\text{mm}$	<Inner border line of the seal	$\leq T$					
(2) LCD corner broken	 <table border="1" style="margin-top: 10px;"> <tr> <td style="text-align: center;">X</td> <td style="text-align: center;">Y</td> <td style="text-align: center;">Z</td> </tr> <tr> <td style="text-align: center;"><math>\leq 3.0\text{mm}</math></td> <td style="text-align: center;"><math>\leq L</math></td> <td style="text-align: center;"><math>\leq T</math></td> </tr> </table>	X	Y	Z	$\leq 3.0\text{mm}$	$\leq L$	$\leq T$	
X	Y	Z						
$\leq 3.0\text{mm}$	$\leq L$	$\leq T$						
(3) LCD crack	 <p style="text-align: center;">Crack Not allowed</p>							

Number	Items	Criteria (mm)																												
2.0	Spot defect  $\Phi = (X+Y)/2$	① light dot (LCD/TP/Polarizer black/white spot, light dot, pinhole, dent, stain) <table border="1"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.10</math></td> <td colspan="3">Ignore</td> </tr> <tr> <td><math>0.10 &lt; \Phi \leq 0.15</math></td> <td colspan="3">3( distance <math>\geq 10\text{mm}</math>)</td> </tr> <tr> <td><math>0.15 &lt; \Phi \leq 0.2</math></td> <td colspan="3">1</td> </tr> <tr> <td><math>0.2 &lt; \Phi</math></td> <td colspan="3">0</td> </tr> </tbody> </table>	Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.10$	Ignore			$0.10 < \Phi \leq 0.15$	3( distance $\geq 10\text{mm}$ )			$0.15 < \Phi \leq 0.2$	1			$0.2 < \Phi$	0							
		Zone Size (mm)		Acceptable Qty																										
			A	B	C																									
$\Phi \leq 0.10$	Ignore																													
$0.10 < \Phi \leq 0.15$	3( distance $\geq 10\text{mm}$ )																													
$0.15 < \Phi \leq 0.2$	1																													
$0.2 < \Phi$	0																													
② Dim spot (LCD/TP/Polarizer dim dot, light leakage, dark spot) <table border="1"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.1</math></td> <td colspan="3">Ignore</td> </tr> <tr> <td><math>0.1 &lt; \Phi \leq 0.2</math></td> <td colspan="3">2( distance <math>\geq 10\text{mm}</math>)</td> </tr> <tr> <td><math>0.2 &lt; \Phi \leq 0.3</math></td> <td colspan="3">1</td> </tr> <tr> <td><math>\Phi &gt; 0.3</math></td> <td colspan="3">0</td> </tr> </tbody> </table>	Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore			$0.1 < \Phi \leq 0.2$	2( distance $\geq 10\text{mm}$ )			$0.2 < \Phi \leq 0.3$	1			$\Phi > 0.3$	0									
Zone Size (mm)		Acceptable Qty																												
	A	B	C																											
$\Phi \leq 0.1$	Ignore																													
$0.1 < \Phi \leq 0.2$	2( distance $\geq 10\text{mm}$ )																													
$0.2 < \Phi \leq 0.3$	1																													
$\Phi > 0.3$	0																													
③ Polarizer accidented spot <table border="1"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.2</math></td> <td colspan="3">Ignore</td> </tr> <tr> <td><math>0.2 &lt; \Phi \leq 0.5</math></td> <td colspan="3">2( distance <math>\geq 10\text{mm}</math>)</td> </tr> <tr> <td><math>\Phi &gt; 0.5</math></td> <td colspan="3">0</td> </tr> </tbody> </table>	Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore			$0.2 < \Phi \leq 0.5$	2( distance $\geq 10\text{mm}$ )			$\Phi > 0.5$	0													
Zone Size (mm)		Acceptable Qty																												
	A	B	C																											
$\Phi \leq 0.2$	Ignore																													
$0.2 < \Phi \leq 0.5$	2( distance $\geq 10\text{mm}$ )																													
$\Phi > 0.5$	0																													
	Line defect (LCD/TP/Polarizer black/white line, scratch, stain)	<table border="1"> <thead> <tr> <th rowspan="2">Width(mm)</th> <th rowspan="2">Length(m m)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.03</math></td> <td>Ignore</td> <td colspan="3">Ignore</td> </tr> <tr> <td><math>0.03 &lt; W \leq 0.05</math></td> <td><math>L \leq 3.0</math></td> <td colspan="3"><math>N \leq 2</math></td> </tr> <tr> <td><math>0.05 &lt; W \leq 0.08</math></td> <td><math>L \leq 2.0</math></td> <td colspan="3"><math>N \leq 2</math></td> </tr> <tr> <td><math>0.08 &lt; W</math></td> <td colspan="4">Define as spot defect</td> </tr> </tbody> </table>	Width(mm)	Length(m m)	Acceptable Qty			A	B	C	$\Phi \leq 0.03$	Ignore	Ignore			$0.03 < W \leq 0.05$	$L \leq 3.0$	$N \leq 2$			$0.05 < W \leq 0.08$	$L \leq 2.0$	$N \leq 2$			$0.08 < W$	Define as spot defect			
Width(mm)	Length(m m)	Acceptable Qty																												
		A	B	C																										
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$0.05 < W \leq 0.08$	$L \leq 2.0$	$N \leq 2$																												
$0.08 < W$	Define as spot defect																													

3.0	Polarizer Bubble	<table border="1"> <tr> <td rowspan="2">Zone Size (mm)</td> <td colspan="3">Acceptable Qty</td> </tr> <tr> <td>A</td> <td>B</td> <td>C</td> </tr> <tr> <td><math>\Phi \leq 0.2</math></td> <td colspan="2">Ignore</td> <td rowspan="4">Ignore</td> </tr> <tr> <td><math>0.2 &lt; \Phi \leq 0.4</math></td> <td colspan="2">2(distance <math>\geq 10</math>mm)</td> </tr> <tr> <td><math>0.4 &lt; \Phi \leq 0.6</math></td> <td colspan="2">1</td> </tr> <tr> <td><math>0.6 &lt; \Phi</math></td> <td colspan="2">0</td> </tr> </table>	Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore		Ignore	$0.2 < \Phi \leq 0.4$	2(distance $\geq 10$ mm)		$0.4 < \Phi \leq 0.6$	1		$0.6 < \Phi$	0	
		Zone Size (mm)		Acceptable Qty																		
			A	B	C																	
		$\Phi \leq 0.2$	Ignore		Ignore																	
		$0.2 < \Phi \leq 0.4$	2(distance $\geq 10$ mm)																			
$0.4 < \Phi \leq 0.6$	1																					
$0.6 < \Phi$	0																					
4.0	SMT	According to IPC-A-610C class II standard. Function defect and missing part are major defect, the others are minor defect.																				

## 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 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 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 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

TBD