深圳市美显实业有限公司
LCD Mall Limited

Product Specification

Model Name	**LM022TQ02NS**
Description	Standard LCD Module 2.2" QVGA 240(RGB)x320 Dots
Date	2018/08/18
Version	1.0

■ **Preliminary Specification**

□ **Final Product Specification**

Prepared by	Checked by	Approved by
SXY 2018/08/18	SXY 2018/08/18	LX 2018/08/18

For Customer Approval

Approved By	Comment

Table of Contents

1. Record of Revision

Rev	Issued Date	Description	Editor
1.0	2018/08/18	First Release.	SXY

2. General Specifications

Feature		Spec
Characteristics	Size	2.2 inch
	Resolution	240(horizontal)*320(Vertical)
	Interface	18-BIT RGB/MCU
	Connect type	Connector
	Display Colors	262K
	Technology type	a-Si
	Pixel pitch (mm)	0.141*0.141
	Pixel Configuration	R.G.B.-Stripe
	Display Mode	Normally White
	LCD Driver IC	ILI9341V
	CTP Driver IC	TBD
	Viewing Direction	6 O'clock
Mechanical	LCM (W x H x D) (mm)	41.04*56.45*2.85
	Active Area(mm)	33.84*45.12
	With /Without TSP	Without TSP
	Weight (g)	TBD
	LED Numbers	3 LEDs

Note 1: Requirements on Environmental Protection: RoHs
Note 2: LCM weight tolerance: +/- 5%

3. Input/Output Terminals

LCD PIN-MAP

No.	Symbol	Description
1	GND	Power ground.
2~5	IM0~IM3	Select the MCU interface mode. Fix this pin at IOVCC or GND. *Note
6	RESET	This signal will reset device and must be applied to properly initialize the chip. Signal is active low.
7	VSYNC	Frame synchronizing signal for RGB interface operation. Fix to IOVCC or GND level when not in use.
8	HSYNC	Line synchronizing signal for RGB interface operation. Fix to IOVCC or GND level when not in use.
9	DOTCLK	Dot clock signal for RGB interface operation. Fix to IOVCC or GND level when not in use.
10	ENABLE	Data enable signal for RGB interface operation. Fix to IOVCC or GND level when not in use.
11~28	DO17~DB0	Data bus
29	SDI	When IM[3]: Low, Serial in/out signal. When IM[3]: High, Serial in/out signal. The data is applied on the rising edge of the SCL signal. If not used, fix this pin at IOVCC or GND.
30	RD	8080-/808-I 0-II system(RDX): Serves as a read signal and MCU read data at the rising edge. Fix to IOVCC Level when not in use.
31	WR	(WRX)-8080-I/8080-II system: Serves as a write signal and writes data at the rising edge. (D/CX)-4-line system: Serves as the selector of command or parameter. Fix to IOVCC level when not in use.
32	RS	(D/CX): This pin is used to select" Data or Command" in the parallel interface. When DCX=1, data is selected. When DCX=0, Command is selected. （SCL）:This pin is used as the serial interface clock in 3-wire 9-bit/4-wire 8-bit serial data interface. If not used, this pin should be connected to IOVCC or GND
33	CS	Chip select input pin("Low" enable). This pin can be permanently fixed "Low" in MPU interface mode only.
34	FMARK	Tearing effect output pin to synchronize MPU to frame writing, activated by S/W command. When this pin is not activated, this pin is low. If not used, open this pin.
35	IOVCC	Power supply for logic.

36	VCI	Power supply for analog.
37	GND	Power ground
38	LEDA	Anode of LED backlight.
39~41	LEDK1~K3	Cathode of LED backlight

4. Absolute Maximum Rating

Item	Symbol	MIN	MAX	Unit
Supply voltage for analog	VCI	-0.3	4.6	V
Supply voltage for logic	IOVCC	-0.3	4.6	V
Supply current (One LED)	I_{LED}		30	mA
Operating temperature	T_{OP}	-20	+70	℃
Storage temperature	T_{ST}	-30	+80	℃

Note: The absolute maximum rating values of this product are not allowed to be exceeded at any times.
Should a module be used with any of the absolute maximum ratings exceeded, the characteristics
Of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

5. Electrical Characteristics

5.1 Input Power

Item	Symbol	Min	Typ	Max	Unit	Applicable terminal
Supply Voltage for Analog	VCI	2.5	2.8	3.3	V	
Supply Voltage for Logic	IOVCC	1.65	1.8/2.8	3.3	V	
Input Voltage	V_{IL}	GND	-	0.3IOVCC	V	
	V_{IH}	0.8IOVCC	-	IOVCC		
Input leakage Current	I_{LKG}	-1		1	uA	

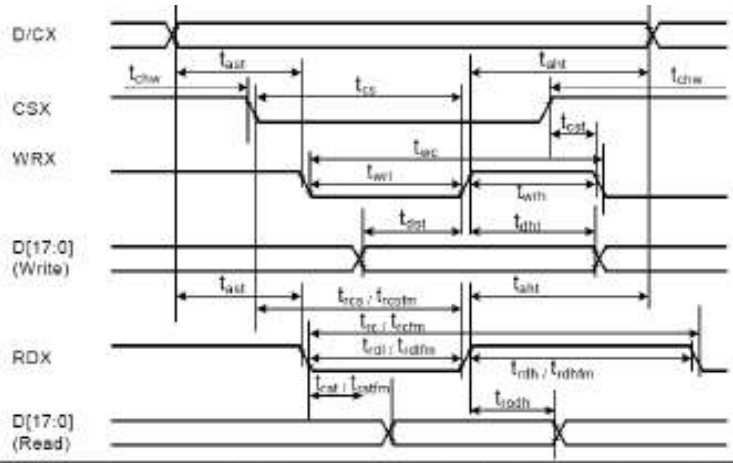
5.2 Backlight Driving Conditions

Item	Symbol	Value			Unit	Remark
		Min	Typ	Max		
Voltage for LED Backlight	V_F	-	3.2	-	V	I_L=45mA
Current for LED Backlight	I_L	-	45	-	mA	
Power Consumption	P	-	0.144	-	W	
LED Life Time		30,000	-	-	Hr	Note

Note: Brightness to be decreased to 50% of the initial value at ambient temperature TA=25℃

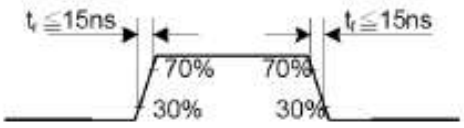
6. Interface Timing

6.1 Parallel 18/16/9/8-bit interface timing characteristics (80-I system)

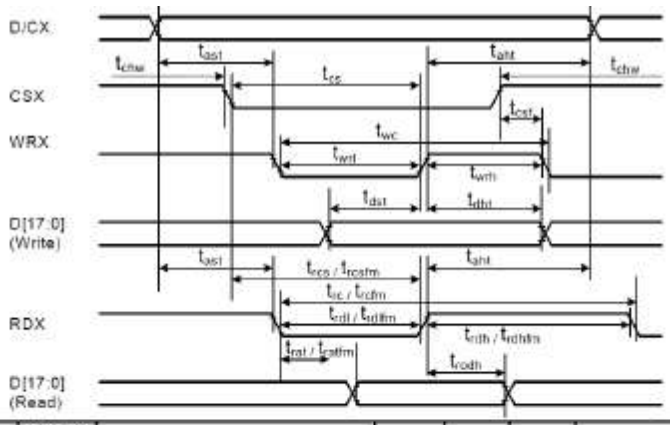


Signal	Symbol	Parameter	min	max	Unit	Description
DCX	tast	Address setup time	0	-	ns	
	taht	Address hold time (Write/Read)	0	-	ns	
CSX	tchw	CSX "H" pulse width	0	-	ns	
	tcs	Chip Select setup time (Write)	15	-	ns	
	trcs	Chip Select setup time (Read ID)	45	-	ns	
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	
	tcsf	Chip Select Wait time (Write/Read)	10	-	ns	
WRX	twc	Write cycle	66	-	ns	
	twrh	Write Control pulse H duration	15	-	ns	
	twrl	Write Control pulse L duration	15	-	ns	
RDX (FM)	trcfm	Read Cycle (FM)	450	-	ns	
	trdhfm	Read Control H duration (FM)	90	-	ns	
	trdlfm	Read Control L duration (FM)	355	-	ns	
RDX (ID)	trc	Read cycle (ID)	160	-	ns	
	trdh	Read Control pulse H duration	90	-	ns	
	trdl	Read Control pulse L duration	45	-	ns	
D[17:0], D[15:0], D[8:0], D[7:0]	tdst	Write data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	tdht	Write data hold time	10	-	ns	
	trat	Read access time	-	40	ns	
	tratfm	Read access time	-	340	ns	
	trod	Read output disable time	20	80	ns	

Note: Ta = -30 to 70 °C, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, VSS=0V

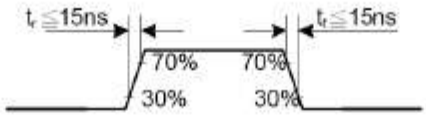


6.2 Parallel 18/16/9/8-bit interface timing characteristics(80-Ⅱ system)

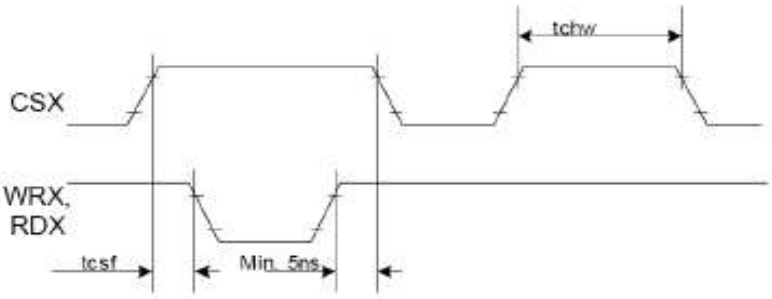


Signal	Symbol	Parameter	min	max	Unit	Description
DCX	tast	Address setup time	0	-	ns	
	taht	Address hold time (Write/Read)	0	-	ns	
CSX	tchw	CSX "H" pulse width	0	-	ns	
	tcs	Chip Select setup time (Write)	15	-	ns	
	trcs	Chip Select setup time (Read ID)	45	-	ns	
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	
	tcsf	Chip Select Wait time (Write/Read)	10	-	ns	
WRX	twc	Write cycle	66	-	ns	
	twrh	Write Control pulse H duration	15	-	ns	
	twrl	Write Control pulse L duration	15	-	ns	
RDX (FM)	trcfm	Read Cycle (FM)	450	-	ns	
	trdhfm	Read Control H duration (FM)	90	-	ns	
	trdlfm	Read Control L duration (FM)	355	-	ns	
RDX (ID)	trc	Read cycle (ID)	160	-	ns	
	trdh	Read Control pulse H duration	90	-	ns	
	trdl	Read Control pulse L duration	45	-	ns	
D[17:0], D[17:10]&D[8:1], D[17:10], D[17:9]	tdst	Write data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	tdht	Write data hold time	10	-	ns	
	trat	Read access time	-	40	ns	
	tratfm	Read access time	-	340	ns	
	trod	Read output disable time	20	80	ns	

Note: Ta = -30 to 70 °C, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, VSS=0V.

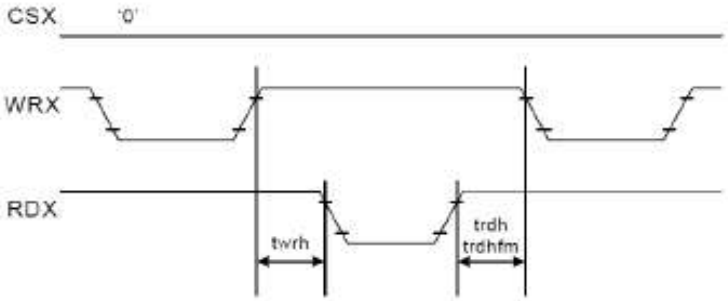


CSX timings :



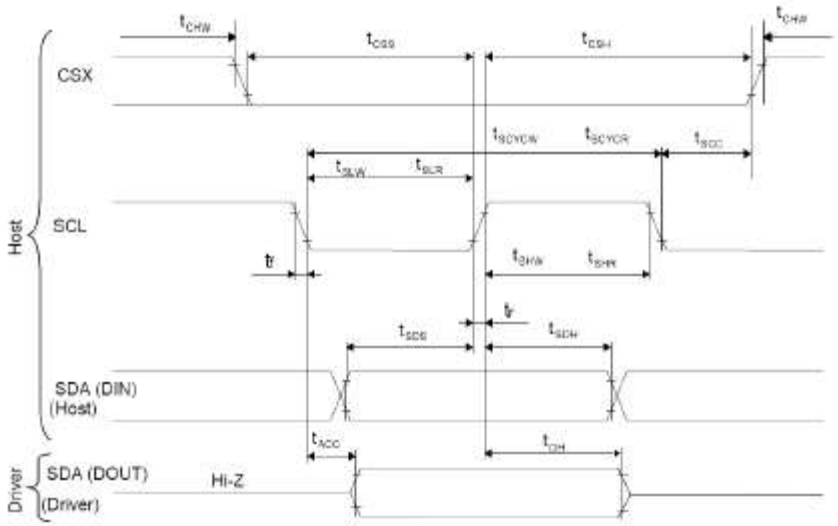
Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

Write to read or read to write timings:



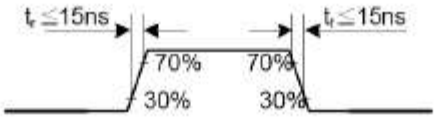
Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

6.3 Serial interface timing characteristics (3-line SPI system)

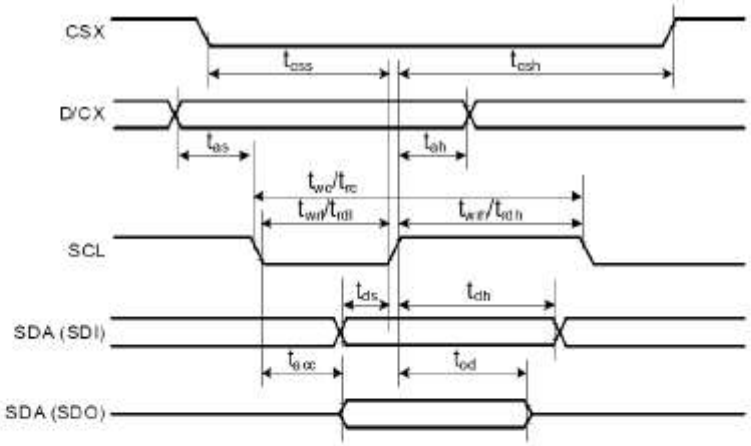


Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	100	-	ns	
	tshw	SCL "H" Pulse Width (Write)	40	-	ns	
	tslw	SCL "L" Pulse Width (Write)	40	-	ns	
	tscycr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	60	-	ns	
SDA / 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	tscc	SCL-CSX	20	-	ns	
	tchw	CSX "H" Pulse Width	40	-	ns	
	tcss	CSX-SCL Time	60	-	ns	
	tcsh		65	-	ns	

Note: Ta = 25 °C, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, AGND=VSS=0V

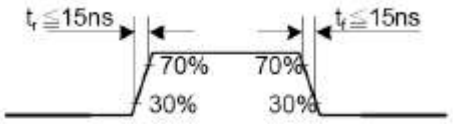


6.4 Serial interface timing characteristics (4-line SPI system)

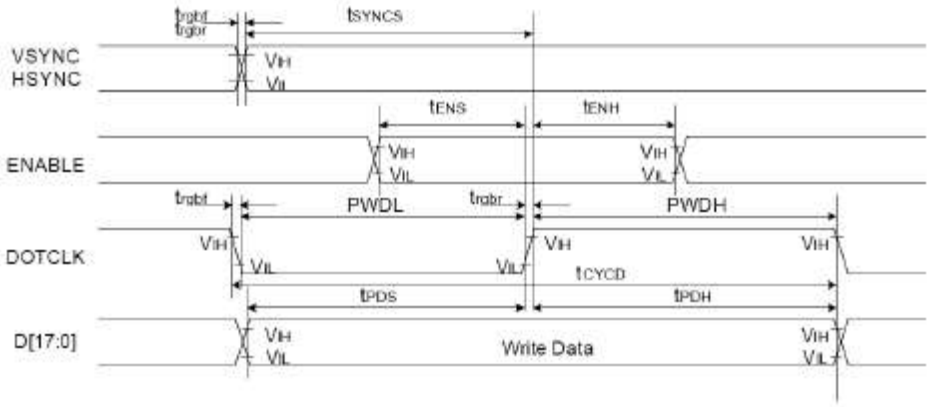


Signal	Symbol	Parameter	min	max	Unit	Description
CSX	tcss	Chip select time (Write)	40	-	ns	
	tcsh	Chip select hold time (Read)	40	-	ns	
SCL	twc	Serial clock cycle (Write)	100	-	ns	
	twrh	SCL "H" pulse width (Write)	40	-	ns	
	twrl	SCL "L" pulse width (Write)	40	-	ns	
	trc	Serial clock cycle (Read)	150	-	ns	
	trdh	SCL "H" pulse width (Read)	60	-	ns	
	trdl	SCL "L" pulse width (Read)	60	-	ns	
D/CX	tas	D/CX setup time	10	-		
	tah	D/CX hold time (Write / Read)	10	-		
SDA / SDI (Input)	tds	Data setup time (Write)	30	-	ns	
	tdh	Data hold time (Write)	30	-	ns	
SDA / SDO (Output)	tacc	Access time (Read)	10	-	ns	For maximum CL=30pF
	tod	Output disable time (Read)	10	50	ns	For minimum CL=8pF

Note: Ta = 25 °C, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, AGND=VSS=0V

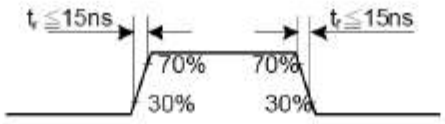


6.5 Parallel 18/16/6-bit RGB interface timing characteristics

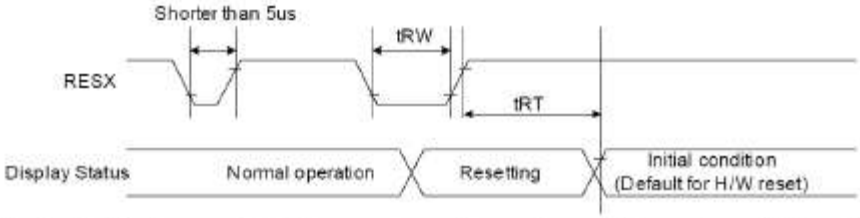


Signal	Symbol	Parameter	min	max	Unit	Description
VSYNC / HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	18/16-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
DE	t_{ENS}	DE setup time	15	-	ns	
	t_{ENH}	DE hold time	15	-	ns	
D[17:0]	t_{PDS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold 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_{ENS}	DE setup time	15	-	ns	
	t_{ENH}	DE hold time	15	-	ns	
D[17:0]	t_{PDS}	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	50	-	ns	
	t_{rgbr}, t_{rgbf}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	

Note: Ta = -30 to 70 °C, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, AGND=VSS=0V



6.6 Reset timing



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

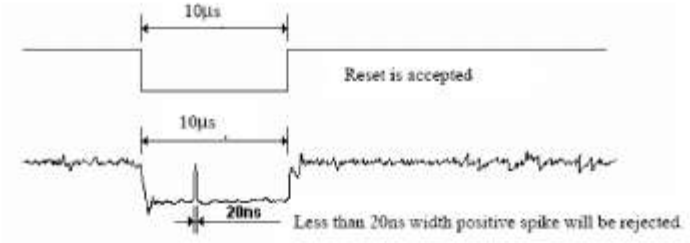
Note 1: The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NV memory to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

Note 2: 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 5us	Reset Rejected
Longer than 10us	Reset
Between 5us and 10us	Reset starts

Note 3: 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 return to Default condition for Hardware Reset.

Note 4: Spike Rejection also applies during a valid reset pulse as shown below:



Note 5: When Reset applied during Sleep In Mode.

Note 6: When Reset applied during Sleep Out Mode.

Note 7: It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

7. Optical Characteristics

ITEM		SYMBOL	CONDITIONS	SPECIFICATIONS			UNIT	NOTE
				MIN	TYP	MAX		
Luminance		L	IL=20mA		200		Cd/m²	
Contrast Ratio		CR	Θ=0°	250	350			
Response Time		T_{ON}	25℃		20	30	ms	
		T_{OFF}						
CIE Color Coordinate	Red	X_R	Viewing normal angle		-			
		Y_R			-			
	Green	X_G			-			
		Y_G			-			
	Blue	X_B			-			
		Y_B			-			
	White	X_W			0.310			
		Y_W			0.330			
Viewing Angle	Hor	$Θ_{x+}$			45		Degree	Gray Scale inversion
		$Θ_{x-}$			45			
	Ver	$Θ_{y+}$			50			
		$Θ_{y+}$			20			
Uniformity	Un			80			%	

Note1. Definition of contrast ratio

Contrast ratio(Cr) is defined mathematically by the following formula. For more information see FIG.2.

$$\text{Contrast ratio} = \frac{\text{Luminance measured when LCD on the “White” state}}{\text{Luminance measured when LCD on the “Black” state}}$$

For contrast ratio, Surface Luminance, Luminance uniformity and CIE,the testing data is base on TOPCON’s BM-5 or BM-7 photo detector or compatible.

Note2. Definition of surface luminance.

Surface luminance is the luminance with all pixels displaying white. For more information see FIG.2.

Lv = Average Surface Luminance with all white pixels(P1,P2,P3, ……,Pn)

Note3. Definition of luminance uniformity

The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1 through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance.For more information see FIG.2.

$$YU = \frac{\text{Minimum surface luminance with all white pixels (P1,P2,P3,……,Pn)}}{\text{Maximum surface luminance with all white pixels (P1,P2,P3,……,Pn)}}$$

Note4. Definition of response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black"state.Rise time (Tr) is the time between photo detector output intensity changed from 90% to 10%. And fall time (Tf) is the time between photo detector output intensity changed from 10% to 90%.
For additional information see FIG1.

Note5. Definition of color chromaticity (CIE1931)

CIE (x,y) chromaticity,The x,y value is determined by screen active area center position P5.For more information see FIG.2.

Note6. Definition of viewing angle

Viewing angle is the angle at which the contrast ratio is greater than 10. 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 LCD surface. For more information see FIG.3.

For viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope or DMS series Instruments or compatible.

FIG.1.The definition of response Time

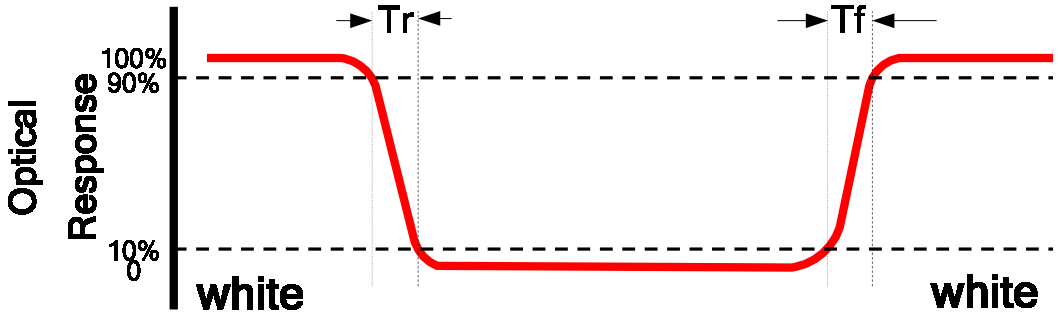


FIG.2. Measuring method for contrast ratio, surface luminance,

luminance uniformity, CIE (x,y) chromaticity

Size : S≤5"(see Figure a) A : 5 mm B : 5 mm
H,V : Active area

Light spot size Ø=5mm(BM-5) or Ø=7.7mm (BM-7)50cm distance or compatible distance from the LCD surface to detector lens.

test spot position : see Figure a.

measurement instrument : TOPCON's luminance meter BM-5 or BM-7 or compatible (see Figure c).

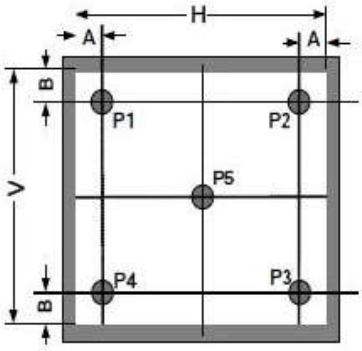


Figure a

Size : 5"＜S≤12.3"(see Figure b) H,V : Active area

Light spot size Ø=5mm(BM-5) or Ø=7.7mm (BM-7)50cm distance or compatible distance from the LCD surface to detector lens.

test spot position : see Figure b.

measurement instrument : TOPCON's luminance meter BM-5 or BM-7 or compatible (see Figure c).

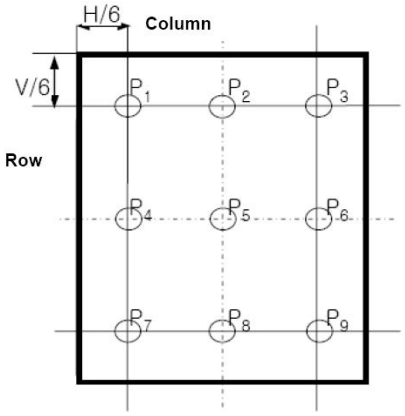


Figure b

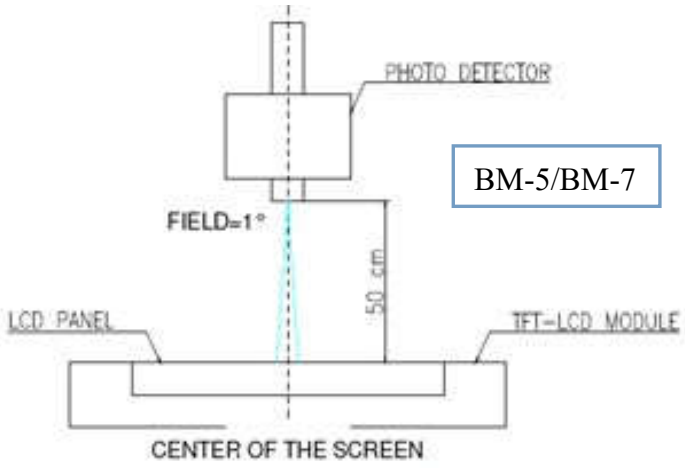
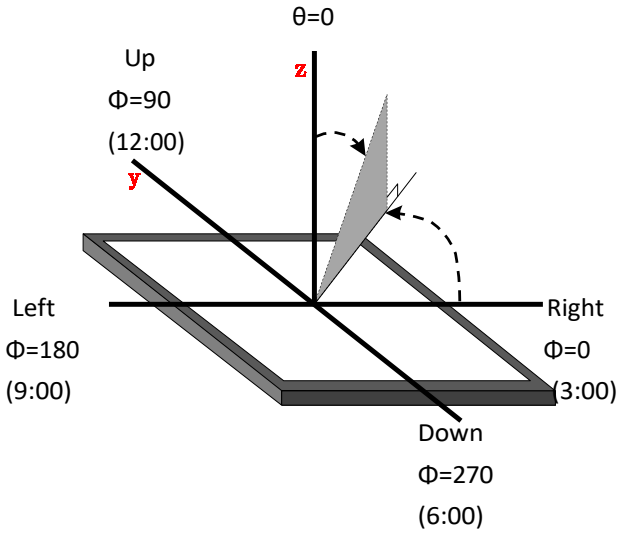


Figure c

FIG.3.The definition of viewing angle

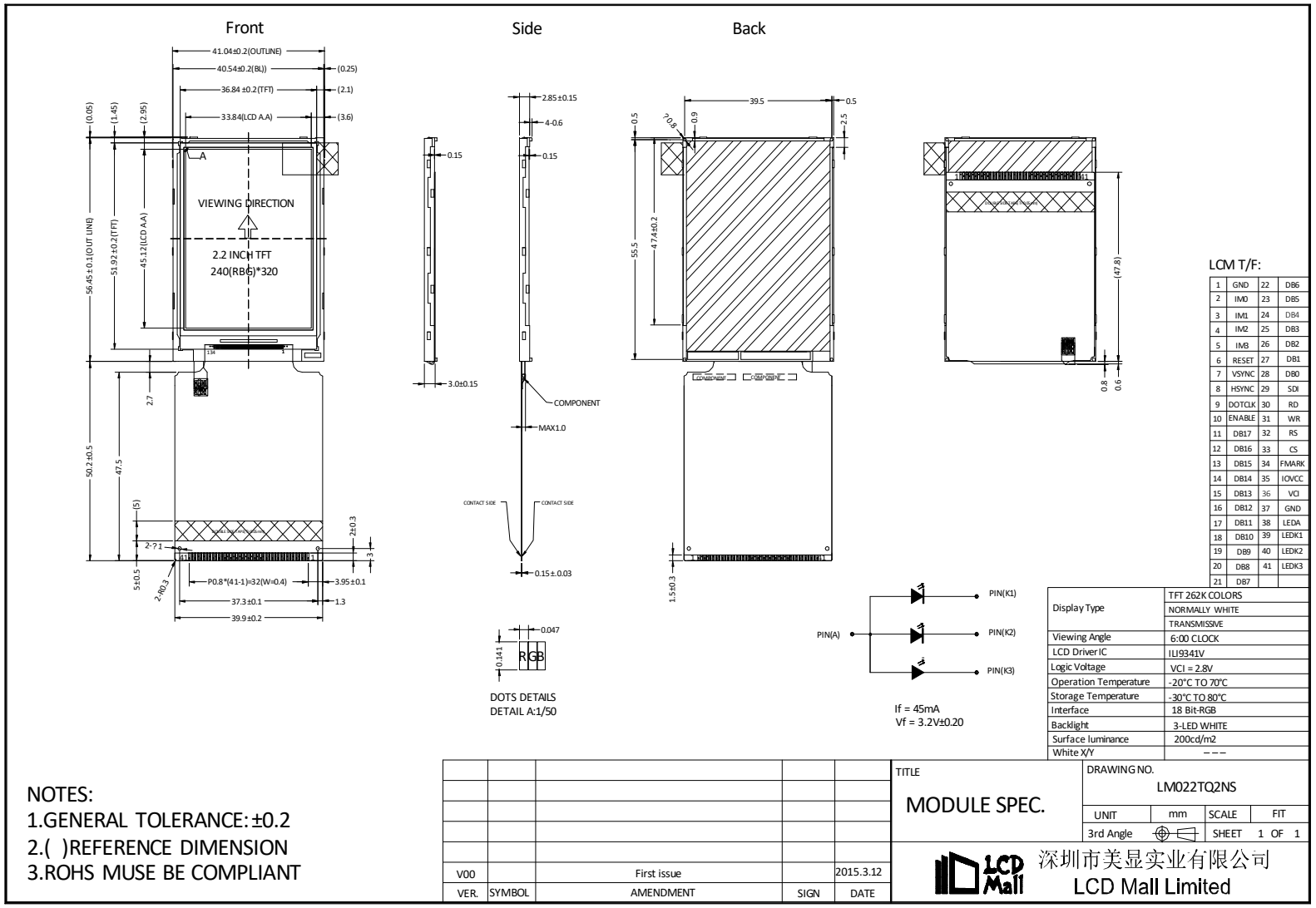


8. Environmental / Reliability Tests

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts= +70℃,120hrs	Note 1 IEC60068-2-2, GB2423. 2-89
2	Low Temperature Operation	Ta= -20℃, 120hrs	Note 2 IEC60068-2-1 GB2423.1-89
3	High Temperature Storage	Ta= +80℃, 240hrs	IEC60068-2-2 GB2423. 2-89
4	Low Temperature Storage	Ta= -30℃, 240hrs	IEC60068-2-1 GB/T2423.1-89
5	High Temperature & Humidity Storage	Ta= +60℃, 90% RH max,120 hours	IEC60068-2-3 GB/T2423.3-2006
6	Thermal Shock (Non-operation)	-20℃ 30 min ~ +60℃ 30 min Change time: 5min, 30 Cycle	Start with cold temperature, end with high temperature IEC60068-2-14, GB2423.22-87
7	Electro Static Discharge (Operation)	C=150pF, R=330 Ω, 5 points/panel Air:±8KV, 5 times; Contact: ±4KV, 5 times; (Environment: 15℃ ~ 35℃, 30% ~ 60%, 86Kpa ~ 106Kpa)	IEC61000-4-2 GB/T17626.2-1998
8	Vibration (Non-operation)	Frequency range: 10~55Hz, Stroke: 1.mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X .Y. Z. (package condition)	IEC60068-2-6 GB/T2423.5-1995
9	Shock (Non-operation)	60G 6ms, ± X, ±Y , ± Z 3 times for each direction	IEC60068-2-27 GB/T2423.5-1995
10	Package Drop Test	Height: 80 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8-1995

Note: 1. Ts is the temperature of panel's surface.
2. Ta is the ambient temperature of sample.
3. The size of sample is 5pcs.

9. Mechanical Drawing



LCM T/F:

1	GND	22	DB6
2	IM0	23	DB5
3	IM1	24	DB4
4	IM2	25	DB3
5	IM3	26	DB2
6	RESET	27	DB1
7	VSYNC	28	DB0
8	HSYNC	29	SDI
9	DOTCLK	30	RD
10	ENABLE	31	WR
11	DB17	32	RS
12	DB16	33	CS
13	DB15	34	FMARK
14	DB14	35	IOVCC
15	DB13	36	VCI
16	DB12	37	GND
17	DB11	38	LEDA
18	DB10	39	LEDK1
19	DB9	40	LEDK2
20	DB8	41	LEDK3
21	DB7		

Display Type	TFT 262K COLORS NORMALLY WHITE TRANSMISSIVE
Viewing Angle	6:00 CLOCK
LCD Driver IC	ILI9341V
Logic Voltage	VCI = 2.8V
Operation Temperature	-20°C TO 70°C
Storage Temperature	-30°C TO 80°C
Interface	18 Bit-RGB
Backlight	3-LED WHITE
Surface luminance	200cd/m2
White X/Y	– – –

NOTES:
1.GENERAL TOLERANCE: ±0.2
2.( )REFERENCE DIMENSION
3.ROHS MUSE BE COMPLIANT

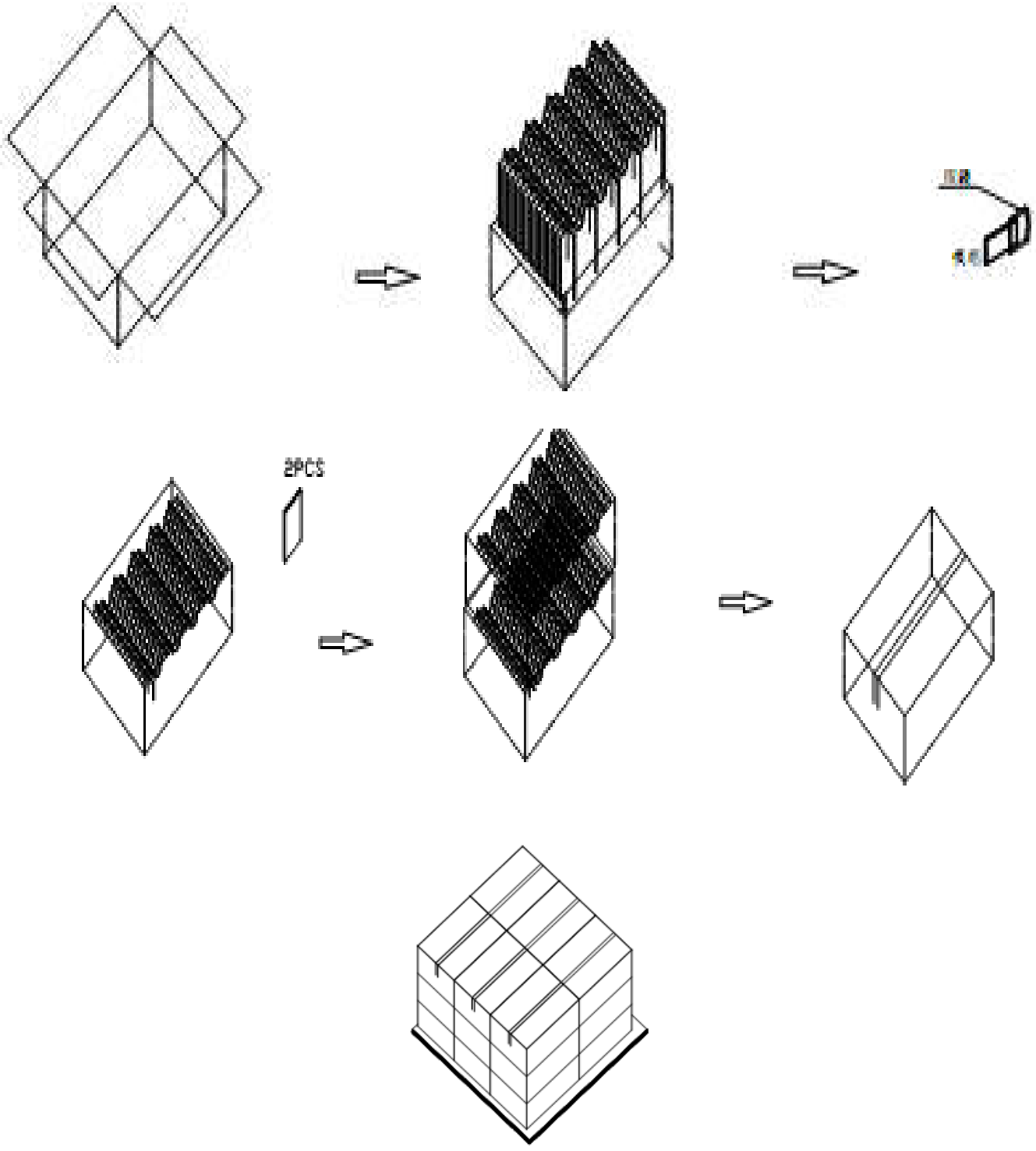
VER.	SYMBOL	AMENDMENT	SIGN	DATE
V00		First issue		2015.3.12

TITLE: MODULE SPEC.
DRAWING NO.: LM022TQ2NS
UNIT: mm | SCALE: FIT | 3rd Angle | SHEET 1 OF 1

深圳市美显实业有限公司
LCD Mall Limited

10. Packing

Packing Method



11.TFT-LCD Module Inspection Criteria

11.1 Scope

The incoming inspection standards shall be applied to TFT –LCD Modules (hereinafter Called "Modules") that supplied by LCD Mall Limited.

11.2 Incoming Inspection

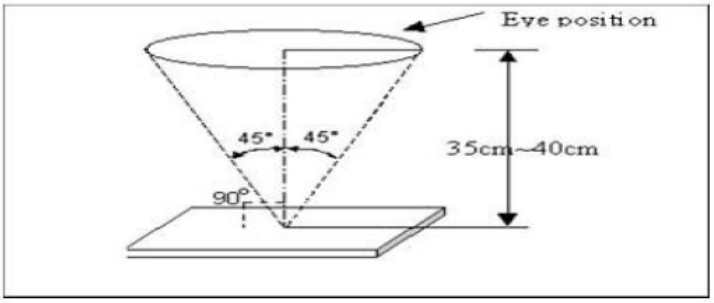
The customer shall inspect the modules within twenty calendar days of the delivery date（the inspection period）at its own cost. The result of the inspection（acceptance or rejection）shall be recorded in writing, and a copy of this writing will be promptly sent to The seller, If the results of the inspecting from buyer does not send to the seller within twenty Calendar days of the delivery date. The modules shall be regards as acceptance.
Should the customer fail to notify the seller within the inspection period, the buyers Right to reject the modules shall be lapsed and the modules shall be deemed to have Been accepted by the buyer

11.3 Inspection Sampling

3.1. Lot size: Quantity per shipment lot per model
3.2. Sampling type: Normal inspection, Single sampling
3.3. Inspection level: II
3.4. Sampling table: MIL-STD-105E
3.5. Acceptable quality level （AQL ）
Major defect: AQL=0.65 Minor defect: AQL=1.00

11.4 Inspection Conditions

4.1 Ambient conditions:
a. Temperature: Room temperature 25±5℃
b. Humidity: (60±10) ％RH
c. Illumination: Single fluorescent lamp non-directive (300 to 700 Lux)
4.2 Viewing distance
The distance between the LCD and the inspector’s eyes shall be at least 35±5 ㎝.
4.3 Viewing Angle
U/D: 45 °/45°, L/R:



45°/45°

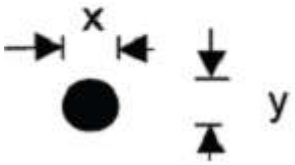
11.5 Inspection Criteria

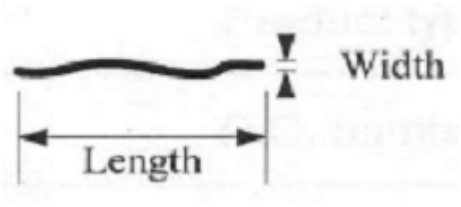
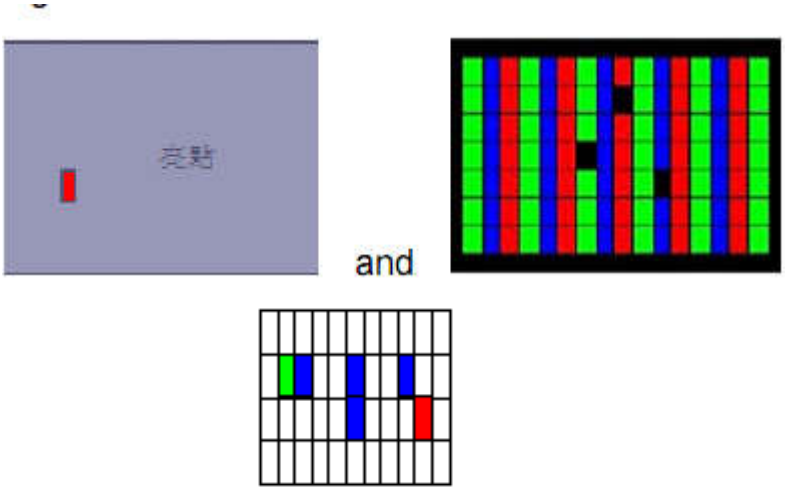
Defects are classified as major defects and minor defects according to the degree of Defectiveness defined herein.

11.5.1 Major defect

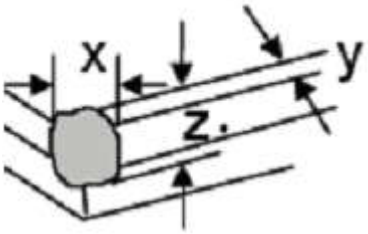
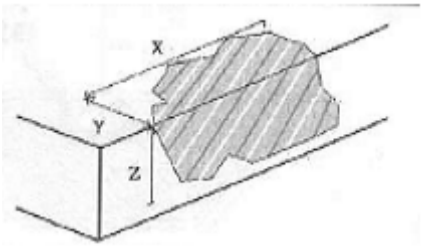
Item No	Items to be inspected	Inspection Standard
5.1.1	All functional defects	1) No display 2) Display abnormally 3) Short circuit 4) line defect
`5.1.2	Missing	Missing function component
5.1.3	Crack	Glass Crack

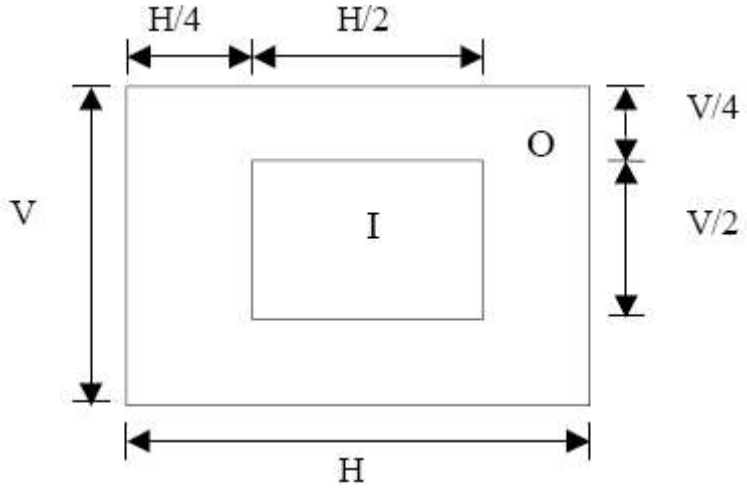
11.5.2 Minor defect

<table>
<tr><th>Item No</th><th>Items to be inspected</th><th colspan="2">Inspection standard</th></tr>
<tr><td rowspan="4">5.2.1</td><td rowspan="4">Spot Defect Including Black spot White spot Pinhole Foreign particle Polarizer dirt</td><td colspan="2">For dark/white spot is defined
$\varphi = (x+y) / 2$
 
</td></tr>
<tr><td>Size ϕ(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>ϕ≤0.2</td><td>Ignore</td></tr>
<tr><td>0.2 < ϕ≤0.5</td><td>3</td></tr>
<tr><td></td><td>0.5 <ϕ</td><td>Not allowed</td></tr>
</table>

<table>
<tr><td rowspan="4">5.2.2</td><td rowspan="4">Line Defect
Including Black line
White line Scratch</td><td colspan="2">Define:
 
</td></tr>
<tr><td>Width(mm)
Length(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>W≤0.05</td><td>Ignore</td></tr>
<tr><td>0.05 ＜W≤0.1
L≤2.5</td><td>3</td></tr>
<tr><td rowspan="6">5.2.3</td><td rowspan="6">Polarizer
Dent/Bubble</td><td>0.1＜W， or L>2.5</td><td>Not allowed</td></tr>
<tr><td>Sizeϕ(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>ϕ≤0.2</td><td>Ignore</td></tr>
<tr><td>0.2 ＜ϕ≤0.3</td><td>2</td></tr>
<tr><td>0.3 ＜ϕ≤0.5</td><td>1</td></tr>
<tr><td>0.5 <ϕ</td><td>Not allowed</td></tr>
<tr><td rowspan="6">5.2.4</td><td rowspan="6">Electrical Dot
Defect</td><td colspan="2">Total QTY</td><td>3</td></tr>
<tr><td colspan="3">Bright and Black dot define:
 

Two Adjacent Dot</td></tr>
<tr><td colspan="3">Inspection pattern: Full white、Full black、Red、green and blue screens</td></tr>
<tr><td rowspan="2">Item</td><td colspan="3">Acceptable Quantity</td></tr>
<tr><td>I</td><td>O</td><td>Note</td></tr>
<tr><td>Black dot defect</td><td colspan="2">2</td><td></td></tr>
</table>

<table>
<tr><td rowspan="4"></td><td rowspan="4"></td><td>Bright dot defect</td><td>1</td><td>(5mm≤Distance)</td></tr>
<tr><td>Two Adjacent Dot</td><td>1</td><td></td></tr>
<tr><td>There or more Adjacent Dot</td><td colspan="2">Not allowed</td></tr>
<tr><td>Total Dot</td><td>2</td><td></td></tr>
<tr><td rowspan="5">5.2.5</td><td rowspan="5">Glass defect</td><td colspan="3">1.Corner Fragment:
 
</td></tr>
<tr><td>Size(mm)</td><td colspan="2">Acceptable Quantity</td></tr>
<tr><td>X≤3mm
Y≤1mm
Z≤T</td><td colspan="2">Ignore
T： Glass thickness
X: Length
Y: Width
Z: thickness</td></tr>
<tr><td colspan="3">2. Side Fragment:
 
</td></tr>
<tr><td>Size(mm)</td><td colspan="2">Acceptable Quantity</td></tr>
<tr><td>X≤5.0mm
Y ≤1mm
Z≤T</td><td colspan="2">T： Glass thickness
X: Length
Y: Width
Z: thickness</td></tr>
</table>



I area & O area

Note: 1). Dot defect is defined as the defective area of the dot area is larger than 50% of the dot area.

2). The distance between two bright dot defects (red, green, blue, and white) should be larger than 15mm.

3). The distance between black dot defects or black and bright dot defects should be more than 5mm apart.

4). Polarizer bubble is defined as the bubble appears on active display area. The defect of polarizer bubble shall be ignored if the polarizer bubble appears on the outside of active display area.

11.6 Mechanics specification

As for the outside dimension, weight of the modules, please refer to product specification For more details

12. Precautions for Use of LCD modules

12.1 Handling Precautions

12.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

12.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

12.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

12.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

12.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

Isopropyl alcohol & Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following: Water & Ketene & Aromatic solvents

12.1.6. Do not attempt to disassemble the LCD Module.

12.1.7. If the logic circuit power is off, do not apply the input signals.

12.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

12.1.8.1. Be sure to ground the body when handling the LCD Modules.

12.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

12.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

12.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

12.2 Storage Precautions

12.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

12.2.2. The LCD modules should be stored under the storage temperature range If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃ Relatively humidity: ≤80%

12.2.3. The LCD modules should be stored in the room without acid, alkali and harmful gas.

12.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.