

深圳市亿显国际科技有限公司 ShenZhen Yes-Display International Technology CO.,LTD.			2.1 寸液晶显示屏 2.1 Inch LCD Display Screen	
File NO.		REV	A/01	http://www.yes-display.com

SPECIFICATION

FOR

LCM MODULE: YS-T021003 V1.0

Designed by	R&D Checked by	Quality Department by	Approved by

Approval by Customer:

OK

NG, Problem survey

Approved By _____

Revision Record

REV NO.	REV DATE	CONTENTS	Note
V1.0	2022/4/25	NEW ISSUE	

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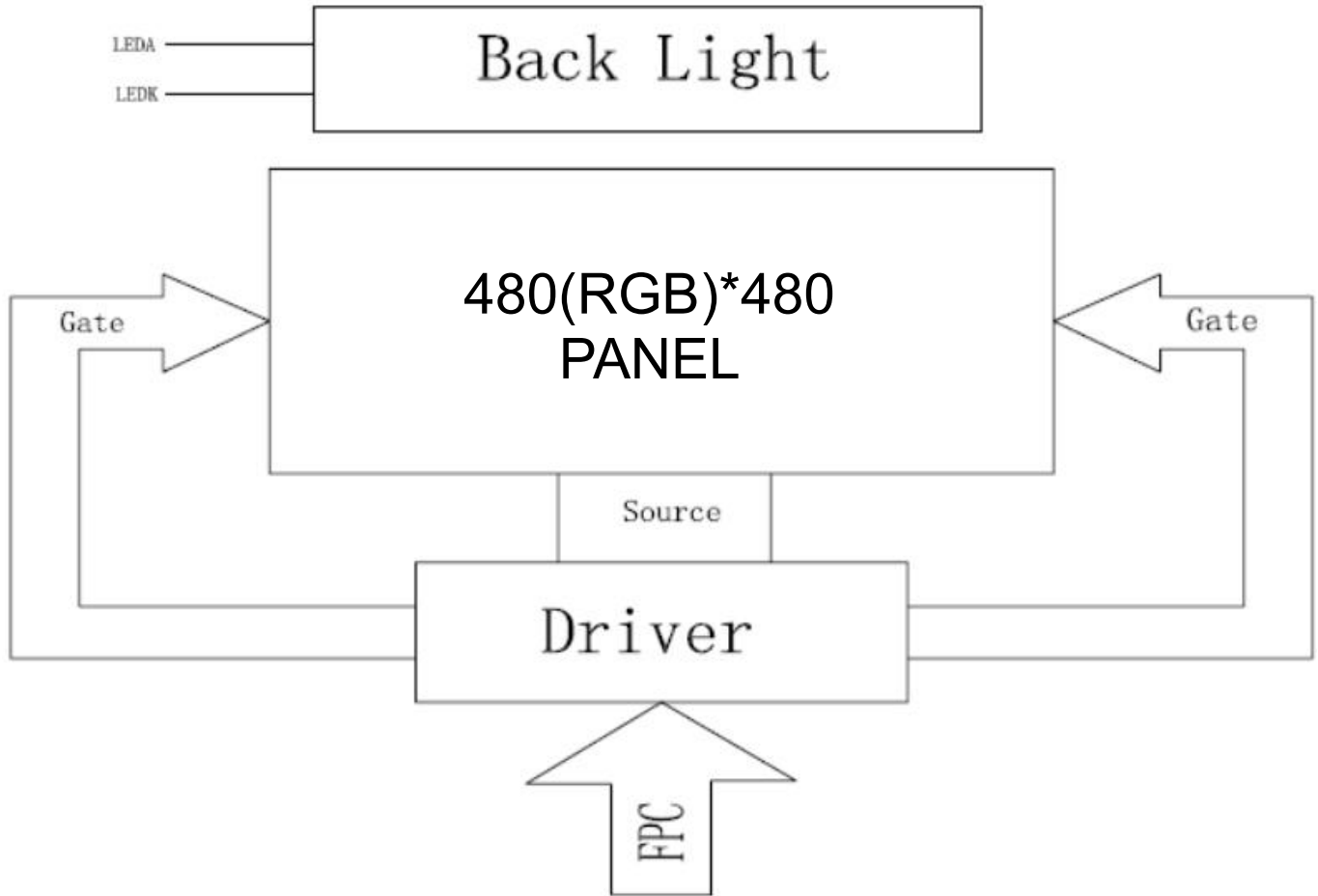
深圳市亿显国际科技有限公司 ShenZhen Yes-Display International Technology CO.,LTD.			2.1 寸液晶显示屏 2.1 Inch LCD Display Screen	
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1. General Information

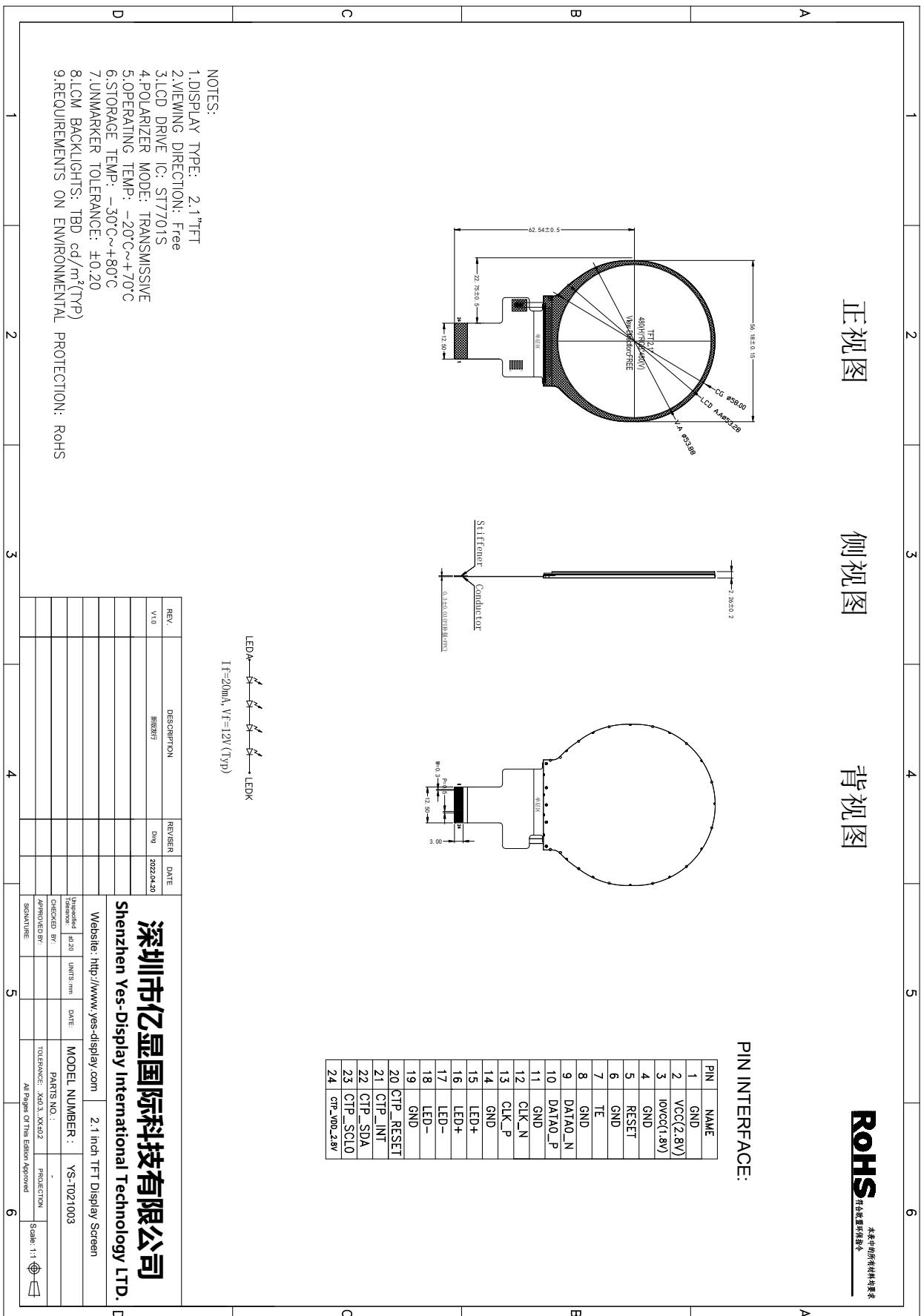
ITEM	STANDARD VALUES	UNITS
LCD type	2.1"TFT	--
Dot arrangement	480(RGB)×480	dots
Color filter array	RGB vertical stripe	--
Display mode	IPS / Transmission / Normally Black	-
Eyes Viewing Direction	80/80/80/80	--
Driver IC	ST7701S	--
Module size	59.71(W)×56.18(H)×2.26(T)(Exclude FPC)	mm
Active area	53.28(W)×53.28(H)	mm
Interface	MIPI	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	White LED*4	--

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2. Block Dimension



3. External Dimensions



4. Interface Description

PIN NO.	PIN NAME	DESCRIPTION
1	GND	Ground for logic.
2	VCC2.8	VCC power input
3	IOVCC	IO System power supply
4	GND	Ground for logic.
5	RESET	Reset signal input terminal, active at 'L'.
6	GND	Ground for logic.
7	TE	TE SIGNAL
8	GND	Ground for logic.
9	D0N	DATA0- differential data signals.
10	D0P	DATA0+ differential data signals.
11	GND	Ground for logic.
12	CLKN	CLK- differential clock signals.
13	CLKP	CLK+ differential clock signals
14	GND	Ground for logic.
15-16	LEDA	Power supply for backlight anode input terminal.
17-18	LEDK	Power supply for backlight cathode input terminal.
19	GND	Ground for logic.
20	TP_RST	CTP-RESET
21	TP_INT	CTP-INT
22	TP_SDA	CTP-SDA
23	TP_SCL	CTP-SCL
24	TP_VDD	2.8V for TP power

5. Absolute Maximum Ratings

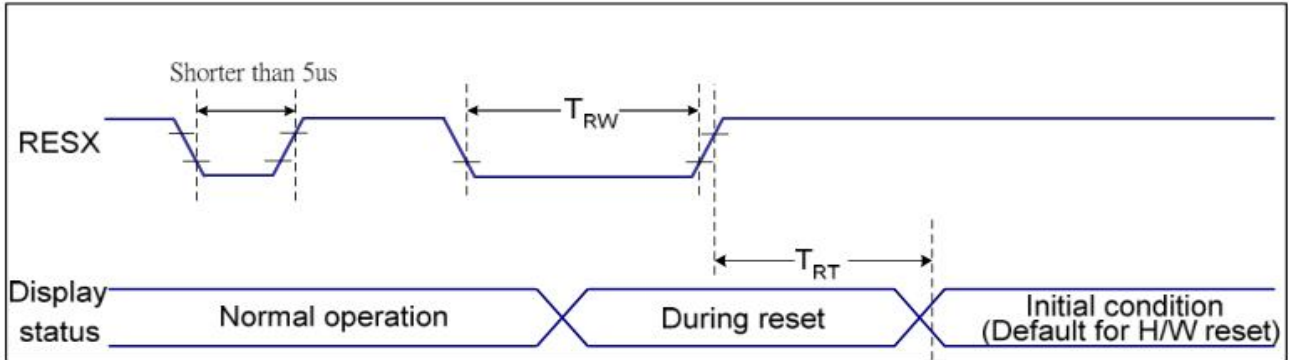
Item	Symbol	Min.	Max.	Unit
Analog supply voltage	VCC	-0.3	3.6	V
Power voltage	IOVCC	-0.3	3.6	V
Operating Temperature	TOP	-20	70	°C
Storage Temperature	TST	-30	80	°C
Storage Humidity	HD	20	90	%RH

6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Input High Voltage	VIH	0.7VDD	-	VDD	V	-
Input Low Voltage	VIL	GND	-	0.3 VDD	V	-
Output High Voltage	VOH	0.8 VDD	-	VDD	V	-
Output Low Voltage	VOL	GND	-	0.2 VDD	V	-
I/O Leak Current	ILI	-1	-	1	uA	-
Analog Supply Voltage	VCC	2.5	-	3.6	V	-
Logic Supply Voltage	IOVCC	1.65	-	3.3	V	-

7. Timing Characteristics

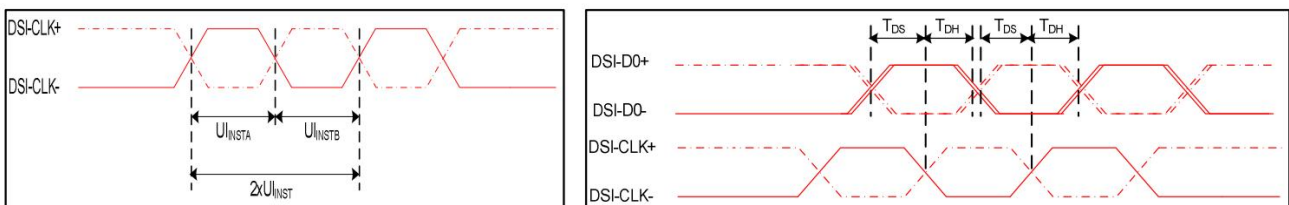
7.1 Reset Timing



Related Pins	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

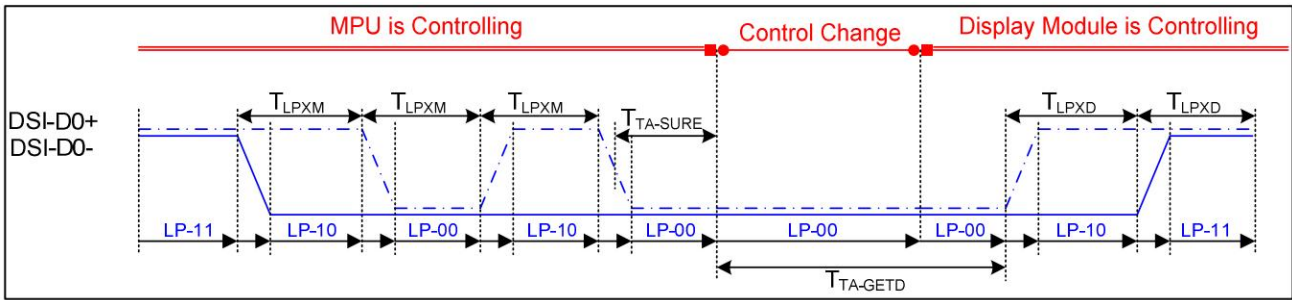
7.2 MIPI Interface Characteristics

High Speed Mode

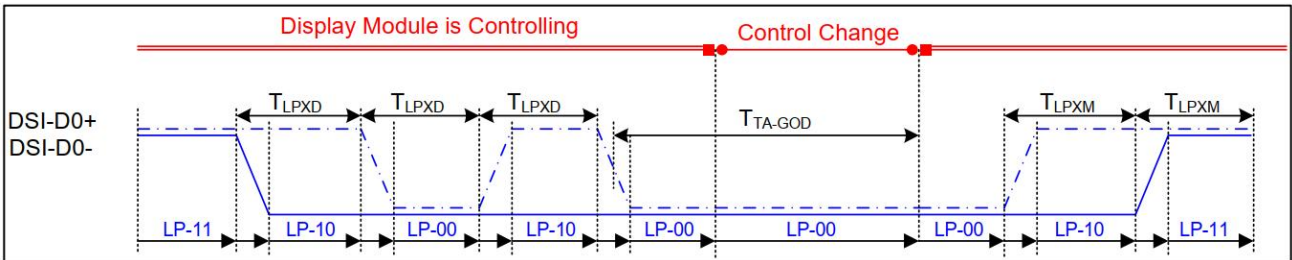


Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-CLK+/-	$2 \times UI_{INSTA}$	Double UI instantaneous	4	25	ns	
DSI-CLK+/-	UI_{INSTA} UI_{INSTB}	UI instantaneous halves	2	12.5	ns	$UI = UI_{INSTA} = UI_{INSTB}$
DSI-Dn+/-	t_{DS}	Data to clock setup time	0.15	-	UI	
DSI-Dn+/-	t_{DH}	Data to clock hold time	0.15	-	UI	

Low Power Mode

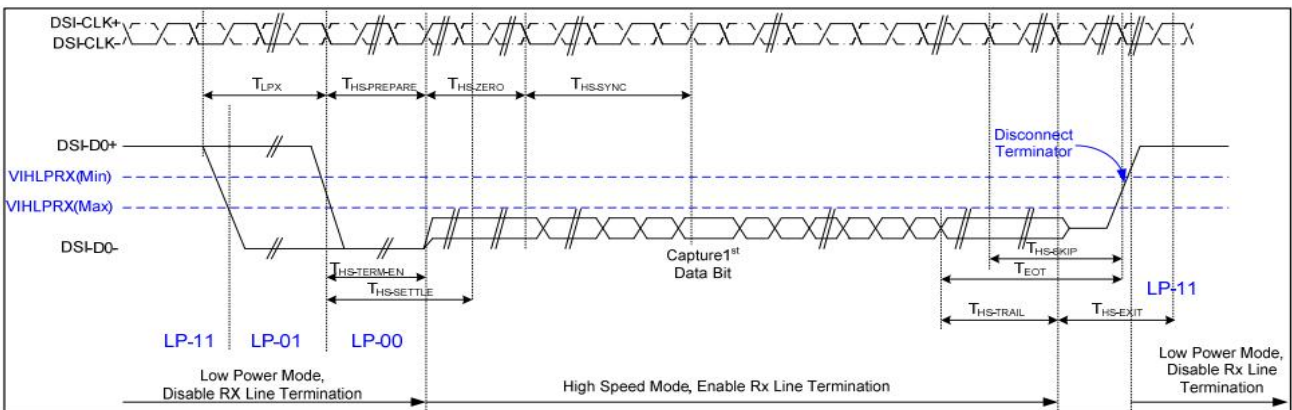


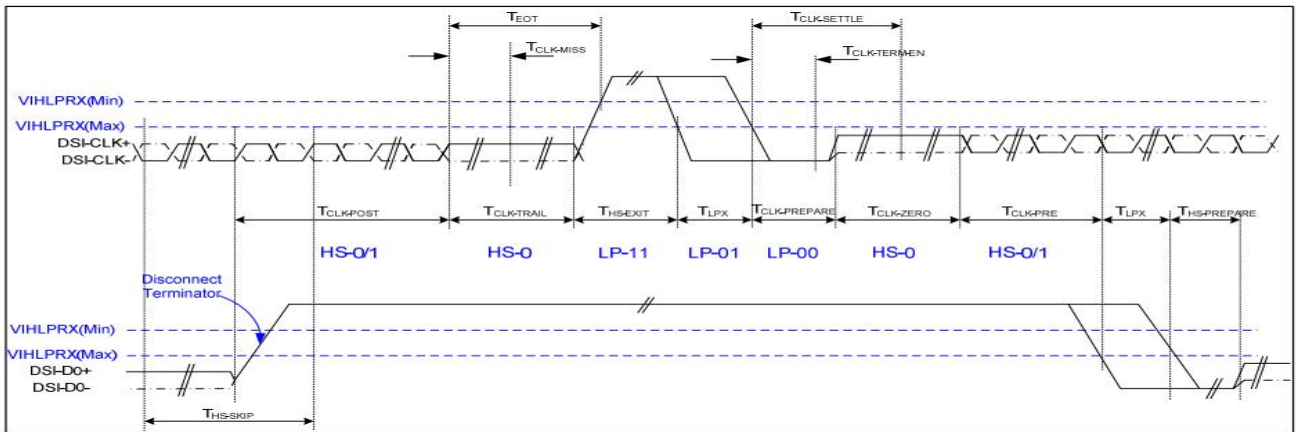
Bus Turnaround (BTA) from display module to MPU Timing



Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-D0+/-	TLPXM	Length of LP-00,LP-01, LP-10 or LP-11 periods MPU→Display Module	50	75	ns	Input
DSI-D0+/-	TLPXD	Length of LP-00,LP-01, LP-10 or LP-11 periods MPU→Display Module	50	75	ns	Output
DSI-D0+/-	TTA-SURED	Time-out before the MPU start driving	T_{LPXD}	$2 \times T_{LPXD}$	ns	Output
DSI-D0+/-	TTA-GETD	Time to drive LP-00 by display module	$5 \times T_{LPXD}$		ns	Input
DSI-D0+/-	TTA-GOD	Time to drive LP-00 after turnaround request-MPU	$4 \times T_{LPXD}$		ns	Output

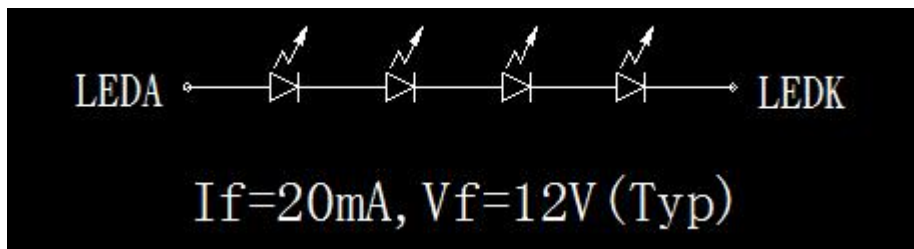
DSI Bursts Mode





Signal	Symbol	Parameter	MIN	MAX	Unit	Description
Low Power Mode to High Speed Mode Timing						
DSI-Dn+/-	TLPX	Length of any low power state period	50	-	ns	Input
DSI-Dn+/-	THS-PREPARE	Time to drive LP-00 to prepare for HS transmission	40+4 UI	85+6 UI	ns	Input
DSI-Dn+/-	THS-TERM-EN	Time to enable data receiver line termination measured from when Dn crosses VILMAX	-	35+4 UI	ns	Input
DSI-Dn+/-	THS-PREPARE + THS-ZERO	THS-PREPARE + time to drive HS-0 before the sync sequence	140+ 10UI	-	ns	Input
High Speed Mode to Low Power Mode Timing						
DSI-Dn+/-	THS-SKIP	Time-out at display module to ignore transition period of EoT	40	55+4 UI	ns	Input
DSI-Dn+/-	THS-EXIT	Time to drive LP-11 after HS burst	100	-	ns	Input
DSI-Dn+/-	THS-TRAIL	Time to drive flipped differential state after last payload data bit of a HS transmission burst	60+4 UI	-	ns	Input
High Speed Mode to/from Low Power Mode Timing						
DSI-CLK+/-	TCLK-POS	Time that the MPU shall continue sending HS clock after the last associated data lane has transition to LP mode	60+5 2UI	-	ns	Input
DSI-CLK+/-	TCLK-TRAIL	Time to drive HS differential state after last payload clock bit of a HS transmission burst	60	-	ns	Input
DSI-CLK+/-	THS-EXIT	Time to drive LP-11 after HS burst	100	-	ns	Input
DSI-CLK+/-	TCLK-PREPARE	Time to drive LP-00 to prepare for HS transmission	38	95	ns	Input
DSI-CLK+/-	TCLK-TERM-EN	Time-out at clock lan display module to enable HS transmission	--	38	ns	Input
DSI-CLK+/-	TCLK-PREPARE + TCLK-ZERO	Minimum lead HS-0 drive period before starting clock	300	-	ns	Input
DSI-CLK+/-	TCLK-PRE	Time that the HS clock shall be driven prior to any associated data lane beginning the transition from LP to HS mode	8UI	-	ns	Input
DSI-CLK+/-	TEOT	Time form start of TCLK-TRAIL period to start of LP-11 state	-	105n s+12 UI	ns	Input

8. Backlight Characteristic

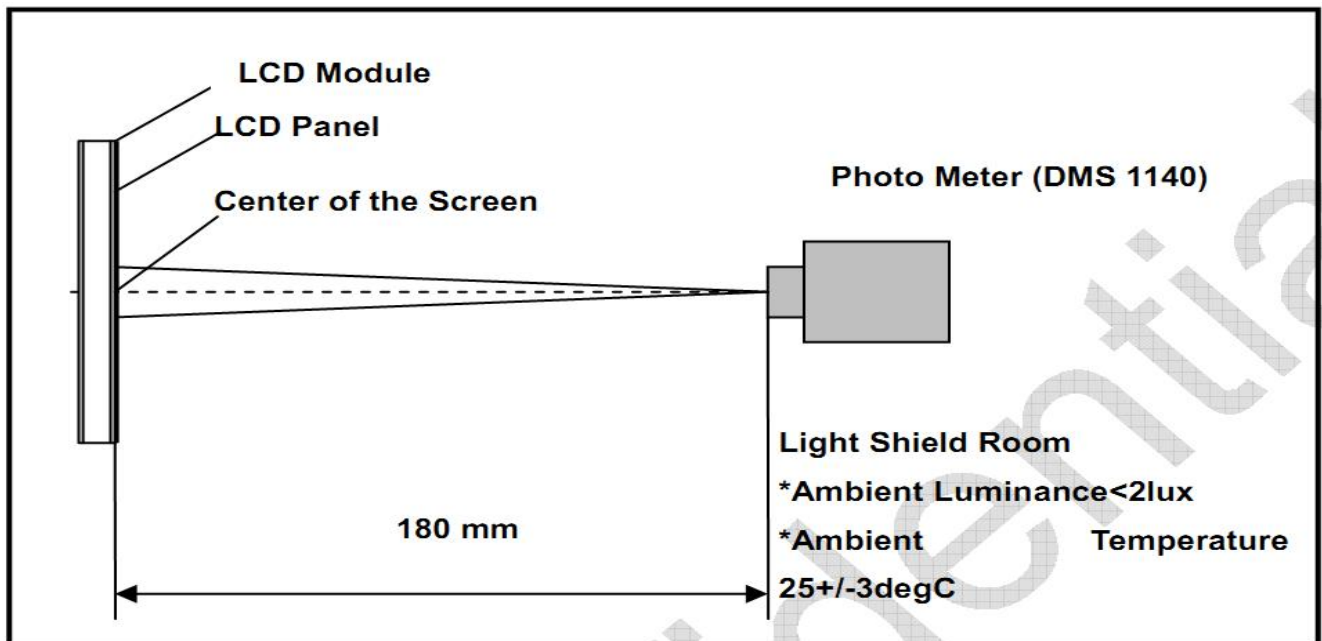


Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	11.2	12	13.2	V	If=20mA
Supply Current	If	-	20	-	mA	定电流
Luminous Intensity for LCM	-	-	300	-	cd/m ²	If=20mA
Uniformity for LCM	-	80	-	-	%	If=20mA
Life Time	-	20000	-	-	Hr	If=20mA
Backlight Color	White					

9. Optical Characteristics

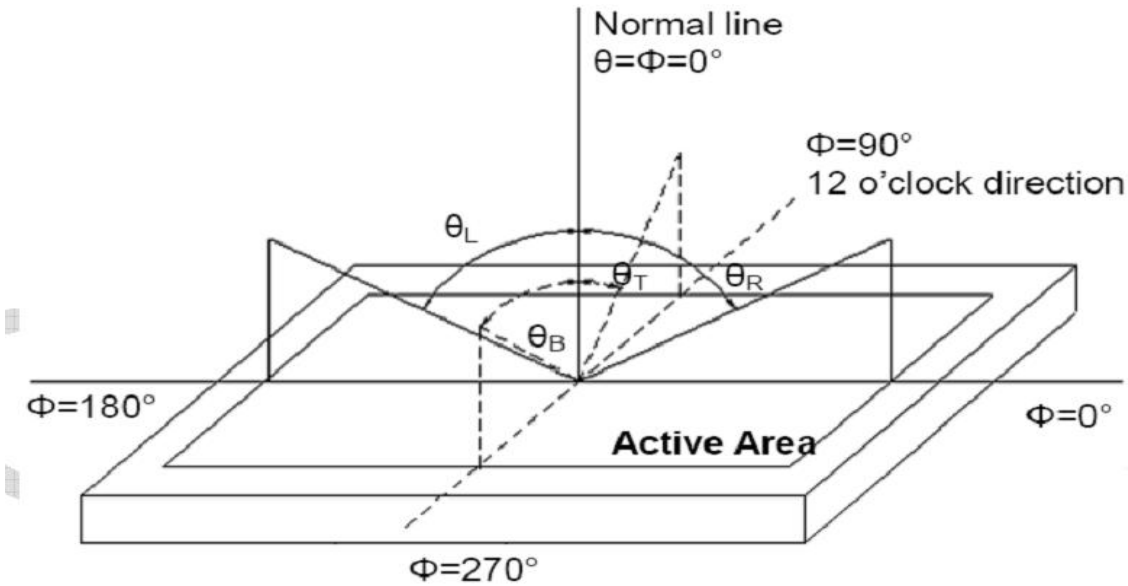
Item	Conditions	Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θL	-	80	-	degree (1),(2),(6)
		θR	-	80	-	
	Vertical	θT	-	80	-	
		θB	-	80	-	
Contrast Ratio	Center	720	900	-	-	(1),(3),(6)
Response Time	Rising+Falling	-	35	45	ms	(1),(4),(6)
CF Color Chromaticity (CIE1931)	Red x	Typ. -0.05	TBD	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.



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Note (2) Definition of Viewing Angle



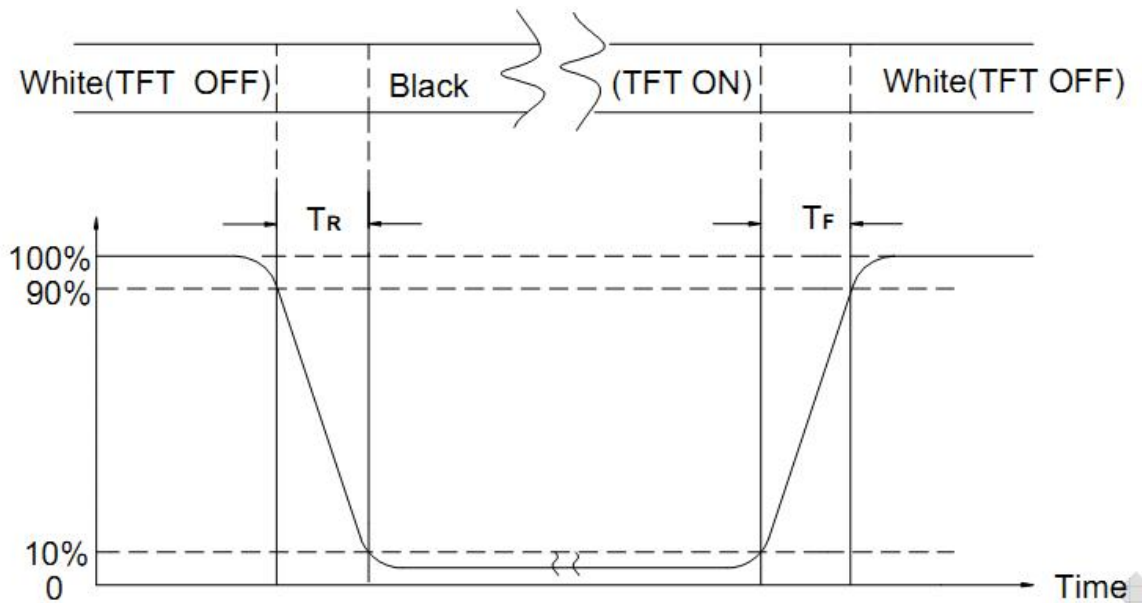
Note (3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

$$\text{Contrast Ratio (CR)} = L63 / L0$$

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)

$$\text{Transmittance} = \text{Center Luminance of LCD} / \text{Center Luminance of Back Light} \times 100\%$$

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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
①	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.
②	Low Temperature Storage	-30°C±2°C×96Hours	
③	High Temperature Operating	70°C±2°C×96Hours	
④	Low Temperature Operating	-20°C±2°C×96Hours	
⑤	Temperature Cycle(Storage)	-20°C ↔ 25°C ↔ 70°C (30min) ← (5min) → (30min) 1cycle Total 10cycle	
⑥	Damp Proof Test (Storage)	50°C±5°C×90%RH×96Hours	
⑦	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)	
⑧	Drooping Test	Drop to the ground from 1M height one time every side of carton. (packing condition test will be tested by a carton)	
⑨	ESD Test	Voltage:±8KV,R:330Ω,C:150PF,Air Mode,10times	

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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 Incoming Inspection and Standard:

The below incoming inspection are applied to the TFT LCM Modules supplied by ShenZhen Yes-Display International Technology CO.,LTD. The customers should inspect the LCM within 14 days after receiving the goods. The result of inspection should be notified to the Seller in the writing copy promptly, if the customer do not send them within 14 days, the seller has the right to judge as acceptance of goods. The inspection lot size is treated as the quantity per shipment and per model. The sampling plan shall be inspected under MIL-STD015E in Level II by single sampling. The acceptable quality level (AQL) are categorized as below grades:

CRITICAL= 0.65%, MAJOR= 0.65%, MINOR= 1.5%

11.2 Inspection condition and Warranty policy:

The delivered LCM should be stored properly, ideally under climate-controlled environment at 25 (±5) degree Celsius as well as 60% (±10) Relative Humidity. The LCM shall be inspected in the viewing angle of 45 degree from the four major angles (U/D/L/R) under the single fluorescent lamp of 20W (equal to 300 to 500 lux). For warranty, ShenZhen Yes-Display International Technology CO.,LTD. will provide 12 months of warranty period as standard, and provide the new replacement for the defective products which belong to the Seller's responsibility verified by the quality department.

11.3 Inspection Criteria:

11.3.1 Critical defect (重度缺失)

Item No.	Inspection content	Judgement

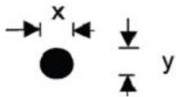
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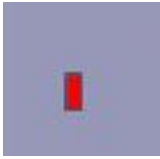
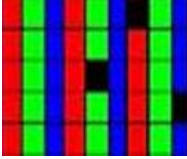
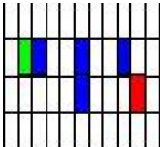
11.3.1.1	Functional defects	No display, abnormal display, short circuit, missing line, off-contrast and chromaticity, Touch Panel non-function
11.3.1.2	Model mixed	Other model mixed

11.3.2 Major defect: (主要缺失)

Item No.	Inspection content	Judgement
11.3.2.1	Product indication	Missing model no. and wrong model no. is indicated on the LCM.
11.3.2.2	Glass cracking	The LCD and touch panel glass crack or breakage
11.3.2.3	Missing component	The function component missing such as connector, cable, etc.

11.3.3 Minor defect (LCD) : (次要缺失)

Item No.	Inspection content	Judgement								
11.3.3.1	Black/White spot Foreign particles Dust in the cell	$\phi = (x+y) / 2$  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Diameter (mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td>Ignore</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.25$</td> <td>3 (Distance>5mm)</td> </tr> <tr> <td>$0.25 < \Phi$</td> <td>Not allowed</td> </tr> </tbody> </table>	Diameter (mm)	Acceptable Q'ty	$\Phi \leq 0.1$	Ignore	$0.1 < \Phi \leq 0.25$	3 (Distance>5mm)	$0.25 < \Phi$	Not allowed
Diameter (mm)	Acceptable Q'ty									
$\Phi \leq 0.1$	Ignore									
$0.1 < \Phi \leq 0.25$	3 (Distance>5mm)									
$0.25 < \Phi$	Not allowed									

<p>11.3.3.2</p>	<p>Linear defect Black/white line Black/white scratch</p>	<table border="1"> <thead> <tr> <th>Length(mm)</th> <th>Width (mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td></td> <td>$W \leq 0.03$</td> <td>Ignore</td> </tr> <tr> <td>$L \leq 5.0$</td> <td>$0.03 < W \leq 0.07$</td> <td>3</td> </tr> <tr> <td></td> <td>$0.07 < W$</td> <td>Follow 11.3.3.1</td> </tr> </tbody> </table>	Length(mm)	Width (mm)	Acceptable Q'ty		$W \leq 0.03$	Ignore	$L \leq 5.0$	$0.03 < W \leq 0.07$	3		$0.07 < W$	Follow 11.3.3.1
Length(mm)	Width (mm)	Acceptable Q'ty												
	$W \leq 0.03$	Ignore												
$L \leq 5.0$	$0.03 < W \leq 0.07$	3												
	$0.07 < W$	Follow 11.3.3.1												
<p>11.3.3.3</p>	<p>Polarizer Bubbles Dent on polarizer</p>	<table border="1"> <thead> <tr> <th>Diameter (mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td>Ignore</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.5$</td> <td>2 (Distance>5mm)</td> </tr> <tr> <td>$0.5 < \Phi$</td> <td>Not allowed</td> </tr> </tbody> </table>	Diameter (mm)	Acceptable Q'ty	$\Phi \leq 0.2$	Ignore	$0.2 < \Phi \leq 0.5$	2 (Distance>5mm)	$0.5 < \Phi$	Not allowed				
Diameter (mm)	Acceptable Q'ty													
$\Phi \leq 0.2$	Ignore													
$0.2 < \Phi \leq 0.5$	2 (Distance>5mm)													
$0.5 < \Phi$	Not allowed													
<p>11.3.3.4</p>	<p>Electrical defect Dot</p>	<p>Bright dot and Dark dot definition:</p> <div style="display: flex; align-items: center;">  or  </div> <div style="margin-top: 10px;">  <p>(Two adjacent dot)</p> </div> <p>Inspection pattern: black, white, red, green, and blue screen.</p> <table border="1"> <thead> <tr> <th>Items</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>Bright dot</td> <td>$N \leq 4$ (Distance >5mm)</td> </tr> <tr> <td>Dark dot</td> <td>$N \leq 4$ (Distance >5mm)</td> </tr> </tbody> </table>	Items	Acceptable Q'ty	Bright dot	$N \leq 4$ (Distance >5mm)	Dark dot	$N \leq 4$ (Distance >5mm)						
Items	Acceptable Q'ty													
Bright dot	$N \leq 4$ (Distance >5mm)													
Dark dot	$N \leq 4$ (Distance >5mm)													

File NO.

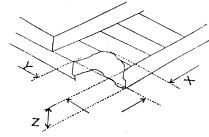
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11.3.3.5

Glass Defect-
Corner chipping



Size(mm)

Judgement

$X \leq 3\text{mm}, Y \leq S,$

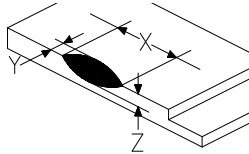
Accept

$Z \leq T$

(S= ITO length,
T=Single glass
thickness)

11.3.3.6

Glass Defect-
Side fragment



Size(mm)

Judgement

$X \leq 2 \text{ mm}, Y \leq \text{border edge}$

Accept

$Z \leq T$

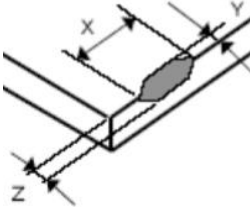
(T= single glass
thickness)

11.3.4 Minor defect (Touch Panel)

Item No.	Inspection content	Judgement								
11.3.4.1	Scratch, dust, particles, foreign materials in "linear type"	<table border="1"> <thead> <tr> <th>Size (mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>$W \leq 0.05\text{mm}, L \leq 10\text{mm}$</td> <td>Ignore</td> </tr> <tr> <td>$0.05\text{mm} < W \leq 0.07\text{mm}, L \leq 10\text{mm}$</td> <td>3</td> </tr> <tr> <td>$W > 0.07\text{mm}$</td> <td>Reject</td> </tr> </tbody> </table>	Size (mm)	Acceptable Q'ty	$W \leq 0.05\text{mm}, L \leq 10\text{mm}$	Ignore	$0.05\text{mm} < W \leq 0.07\text{mm}, L \leq 10\text{mm}$	3	$W > 0.07\text{mm}$	Reject
		Size (mm)	Acceptable Q'ty							
		$W \leq 0.05\text{mm}, L \leq 10\text{mm}$	Ignore							
		$0.05\text{mm} < W \leq 0.07\text{mm}, L \leq 10\text{mm}$	3							
$W > 0.07\text{mm}$	Reject									

11.3.4.2	Scratch, dust, particles, foreign materials in "round type"	<table border="1"> <thead> <tr> <th data-bbox="730 327 1134 405">Diameter (mm)</th> <th data-bbox="1137 327 1442 405">Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td data-bbox="730 409 1134 501">$\Phi \leq 0.25\text{mm}$</td> <td data-bbox="1137 409 1442 501">Ignore</td> </tr> <tr> <td data-bbox="730 506 1134 598">$0.25\text{mm} < \Phi \leq 0.35\text{mm}$</td> <td data-bbox="1137 506 1442 598">5</td> </tr> <tr> <td data-bbox="730 602 1134 680">$\Phi > 0.35\text{mm}$</td> <td data-bbox="1137 602 1442 680">Reject</td> </tr> </tbody> </table>	Diameter (mm)	Acceptable Q'ty	$\Phi \leq 0.25\text{mm}$	Ignore	$0.25\text{mm} < \Phi \leq 0.35\text{mm}$	5	$\Phi > 0.35\text{mm}$	Reject
Diameter (mm)	Acceptable Q'ty									
$\Phi \leq 0.25\text{mm}$	Ignore									
$0.25\text{mm} < \Phi \leq 0.35\text{mm}$	5									
$\Phi > 0.35\text{mm}$	Reject									
11.3.4.3	Air bubbles	<table border="1"> <thead> <tr> <th data-bbox="730 775 1134 853">Diameter (mm)</th> <th data-bbox="1137 775 1442 853">Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td data-bbox="730 857 1134 949">$\Phi \leq 0.2\text{mm}$</td> <td data-bbox="1137 857 1442 949">Ignore</td> </tr> <tr> <td data-bbox="730 954 1134 1046">$0.2\text{mm} < \Phi \leq 0.5\text{mm}$</td> <td data-bbox="1137 954 1442 1046">3</td> </tr> <tr> <td data-bbox="730 1050 1134 1128">$\Phi > 0.5\text{mm}$</td> <td data-bbox="1137 1050 1442 1128">Reject</td> </tr> </tbody> </table>	Diameter (mm)	Acceptable Q'ty	$\Phi \leq 0.2\text{mm}$	Ignore	$0.2\text{mm} < \Phi \leq 0.5\text{mm}$	3	$\Phi > 0.5\text{mm}$	Reject
Diameter (mm)	Acceptable Q'ty									
$\Phi \leq 0.2\text{mm}$	Ignore									
$0.2\text{mm} < \Phi \leq 0.5\text{mm}$	3									
$\Phi > 0.5\text{mm}$	Reject									
11.3.4.5	Scratch on printing area	<table border="1"> <thead> <tr> <th data-bbox="730 1205 1134 1283">Size (mm)</th> <th data-bbox="1137 1205 1442 1283">Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td data-bbox="730 1288 1134 1379">$W \leq 0.03\text{mm}, L \leq 5\text{mm}$</td> <td data-bbox="1137 1288 1442 1379">Ignore</td> </tr> <tr> <td data-bbox="730 1384 1134 1476">$0.03\text{mm} < W \leq 0.05\text{mm}, L \leq 5\text{mm}$</td> <td data-bbox="1137 1384 1442 1476">3</td> </tr> <tr> <td data-bbox="730 1480 1134 1559">$W > 0.05\text{mm}$ or $L > 5\text{mm}$</td> <td data-bbox="1137 1480 1442 1559">Reject</td> </tr> </tbody> </table>	Size (mm)	Acceptable Q'ty	$W \leq 0.03\text{mm}, L \leq 5\text{mm}$	Ignore	$0.03\text{mm} < W \leq 0.05\text{mm}, L \leq 5\text{mm}$	3	$W > 0.05\text{mm}$ or $L > 5\text{mm}$	Reject
Size (mm)	Acceptable Q'ty									
$W \leq 0.03\text{mm}, L \leq 5\text{mm}$	Ignore									
$0.03\text{mm} < W \leq 0.05\text{mm}, L \leq 5\text{mm}$	3									
$W > 0.05\text{mm}$ or $L > 5\text{mm}$	Reject									
11.3.4.6	Corner chipping	<div data-bbox="730 1601 989 1758" style="text-align: center;"> </div> <table border="1"> <thead> <tr> <th data-bbox="730 1776 1153 1854">Size(mm)</th> <th data-bbox="1157 1776 1442 1854">Judgement</th> </tr> </thead> <tbody> <tr> <td data-bbox="730 1859 1153 2060"> $X \leq 2\text{mm}, Y \leq 2\text{mm}$ $Z < 1/2T$ (T= single glass thickness) </td> <td data-bbox="1157 1859 1442 2060">Accept</td> </tr> </tbody> </table>	Size(mm)	Judgement	$X \leq 2\text{mm}, Y \leq 2\text{mm}$ $Z < 1/2T$ (T= single glass thickness)	Accept				
Size(mm)	Judgement									
$X \leq 2\text{mm}, Y \leq 2\text{mm}$ $Z < 1/2T$ (T= single glass thickness)	Accept									

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11.3.4.7	Edge chipping		Size(mm)	Judgement
			$X \leq 3 \text{ mm}, Y \leq 3 \text{ mm}$ $Z \leq 1/2 T$ (T= single glass thickness)	Accept

12. Handling Precautions

12.1 Mounting method

The LCD panel of TFT module consists of two thin glass plates with polarizes which easily be damaged. And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

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 happen 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 use C-MOS LSI drivers, so we recommended 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

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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 then the limit cause the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's how dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- Slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the maximum operating temperature, 50%Rh or less is required.

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

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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 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