

深圳市正晶浩电子有限公司

SHENZHEN ZJH DISPLAYER TECHNOLOGYCO., LTD

服务电话: 133 9284 8764 商务QQ: 15533 09801

APPROVAL SHEET

承认书

记录编号: 版本: v0.0

| | |
|----------------------------------|---|
| Customer 客户名称 | |
| Part NO. 产品型号 | Z144SN005 |
| Product type 产品内容 | Mode: Transmissive type .Normally white. TFT LCD Module LCD Module: Graphic 128RGB*128Dot-matrix |
| Remarks 备注栏 | <input type="checkbox"/> APPROVAL FOR SEPCIFICATIONS ONLY <input checked="" type="checkbox"/> APPROVAL FOR SEPCIFICATIONS AND SAMPLE |
| Signature by Customer: 客户确认签章 | |

| | | |
|----|----|----|
| 核准 | 审核 | 定制 |
| | | |

客户确认

| | | |
|----|----|----|
| 核准 | 审核 | 审核 |
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1. General Description

Z144SN005 is a 128RGB*128 dots matrix TFT LCD module. It has a TFT panel composed of 384sources and 128gates. The LCM can be easily accessed by micro-controller.

2. Features

| | |
|-------------------|-------------------------------|
| Display Mode | Transmissive |
| | a-TFT |
| Display Format | Graphic 128RGB*128 Dot-matrix |
| Input Data | SPI interface |
| Viewing Direction | 12 o'clock |
| Drive | ST7735S |

3. Mechanical Specification

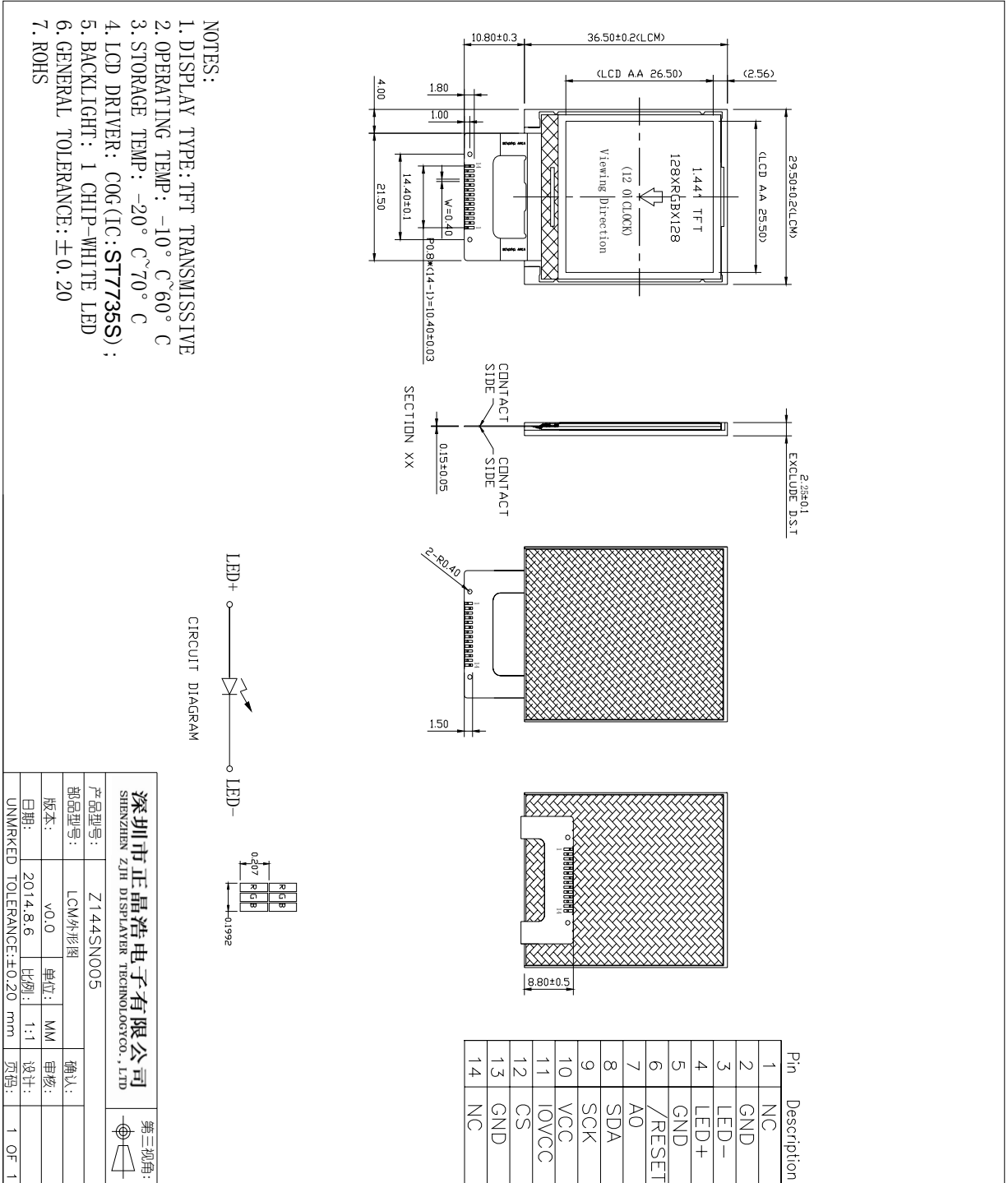
| Item | Specifications | Unit |
|---------------------|--|------|
| Dimensional outline | 29.50(W)*36.50(H)*2.25+/-0.1(T) (FPC not include) | mm |
| Resolution | 128RGB*128 | dots |
| LCD Active area | 25.50 (W)*26.50 (H) | mm |
| Pixel size | 0.20(W)*0.20(H) | mm |

4. Mechanical Dimension

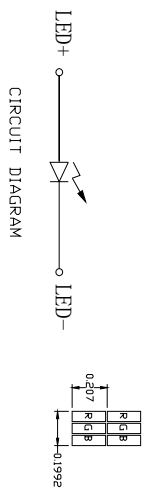
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| Pin | Description |
|-----|-------------|
| 1 | NC |
| 2 | GND |
| 3 | LED- |
| 4 | LED+ |
| 5 | GND |
| 6 | /RESET |
| 7 | A0 |
| 8 | SDA |
| 9 | SCK |
| 10 | VCC |
| 11 | IOVCC |
| 12 | CS |
| 13 | GND |
| 14 | NC |



- NOTES:
1. DISPLAY TYPE: TFT TRANSMISSIVE
 2. OPERATING TEMP: -10° C~60° C
 3. STORAGE TEMP: -20° C~70° C
 4. LCD DRIVER: COG(IC: ST7735S);
 5. BACKLIGHT: 1 CHIP-WHITE LED
 6. GENERAL TOLERANCE: ±0.20
 7. ROHS

| | | |
|--|-----------|------------|
| 深圳市正晶浩电子有限公司 SHENZHEN ZJH DISPLAYER TECHNOLOGYCO., LTD | | 第三视角: |
| 产品型号: | Z144SNO05 | 确认: |
| 部品型号: | LCM外形图 | 审核: |
| 版本: | v0.0 | 单位: MM |
| 日期: | 2014.8.6 | 比例: 1:1 |
| UNMARKED TOLERANCE: ±0.20 mm | | 页码: 1 OF 1 |

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5. Maximum Ratings

| Item | Symbol | Min | Max | Unit | Note |
|-----------------------|------------------|------|----------------------|------|------|
| Supply voltage | V | -0.3 | 4.6 | V | |
| Operating temperature | V _T | -0.3 | V _{CC} +0.3 | V | |
| Storage temperature | T _{OPR} | -20 | 70 | °C | |
| Storage temperature | T _{STR} | -30 | 80 | °C | |

6. Electrical Characteristics

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---------------------|---------|-----------------|--|-----------|------|------------|------|
| Supply voltage | Logic | V _{CC} | | 2.7 | 2.8 | 3.3 | V |
| Input Voltage | H level | T _{IH} | | 0.8*IOVCC | | IOVCC | V |
| | L level | T _{IL} | | -0.3 | | 0.2* IOVCC | |
| Storage temperature | | I _{DD} | With internal voltage generation V _{CC} =2.8V; T _{emp} =25°C | | | TBD | mA |

7. Backlight Characteristic

| Item | Symbol | Min | Typical | Max | Unit |
|-----------------------------------|------------------|------|---------|-----|-------------------|
| LED module Forward voltage | V _{LED} | 3.0 | 3.2 | 3.4 | V |
| LED module current | V _{LED} | | 20 | | mA |
| L/G Surface Luminance ★1 | L _S | 1800 | | | Cd/m ³ |
| LCM Surface brightness uniform ★2 | L _D | 80 | | | % |

★ 1Test condition is:

- (a) Center point on active area.
- (b)Best Contrast.

★2Uniform measure condition:

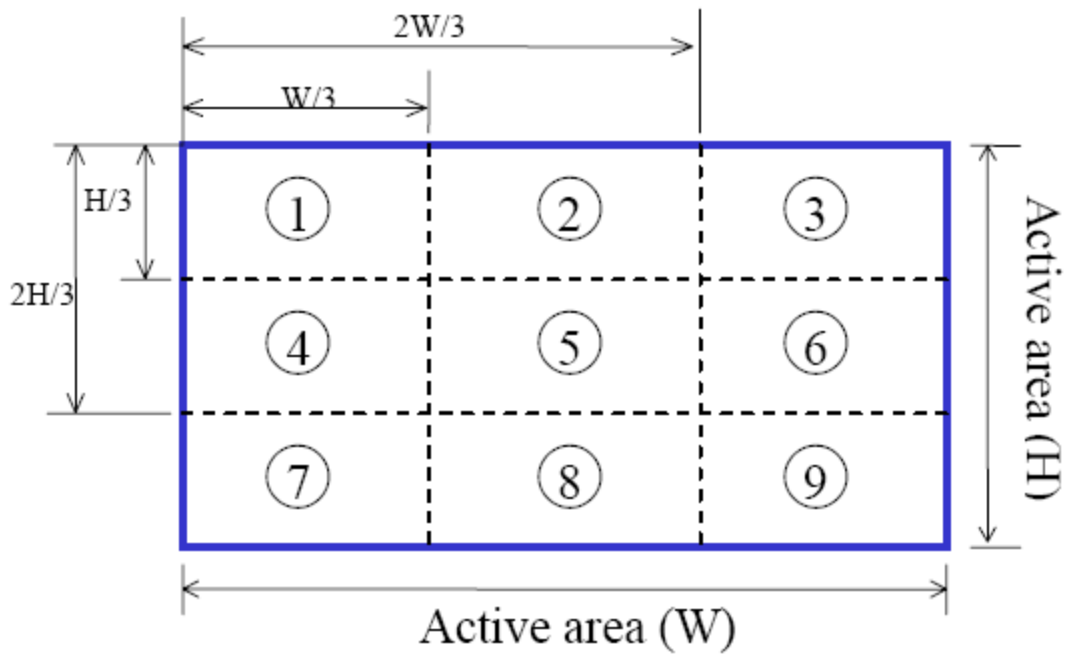
- (1)Measure 9 point. Measure location show below;
- (2)Uniform=(Min. brightness /Max. brightness)*100%

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(3)Best Contrast.



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8. Module Function Description

8.1 Pin Descriptions

| PIN No. | Symbol | Description | Notes |
|---------|--------|---|-------|
| 1 | NC | No connection (悬空) | |
| 2 | GND | Ground (接地脚) | |
| 3 | LED- | Cathode of Backlight (背光负极供电脚) | |
| 4 | LED+ | Anode of Backlight (3.0V-3.4V) (背光正极供电脚) | |
| 5 | GND | Ground (接地脚) | |
| 6 | /RESET | LCM Reset pin (屏复位脚) | |
| 7 | A0 | Register select pin (指令/数据寄存器选择脚) RS='1': Display data. (RS='1':选择数据寄存器) RS='0': Command data. (RS='0':选择指令寄存器) | |
| 8 | SDA | Serial data input / output. (串口数据线) | |
| 9 | SCK | Serial clock pin. (串口时钟线) | |
| 10 | VCC | Power supply for Analog (2.8V-3.3V) (系统电压) | |
| 11 | IOVCC | Power supply for interface(1.8V-3.3V) (I/O口电压) | |
| 12 | CS | Chip select pin ("Low" enable) (屏驱动芯片片选脚, 低电平有效) | |
| 13 | GND | Ground (接地脚) | |
| 14 | NC | No connection (悬空) | |

NOTE: 1. IOVCC Connected to VCC(应用时可以把 IOVCC 和 VCC 连在一起供 2.8-3.3V 的电压。
2.背光 LED 可以单独供电, 也可以和 VCC 共用一组电压供电。

8.2 Timing characteristics.

Serial Interface Characteristics (4-line Serial)

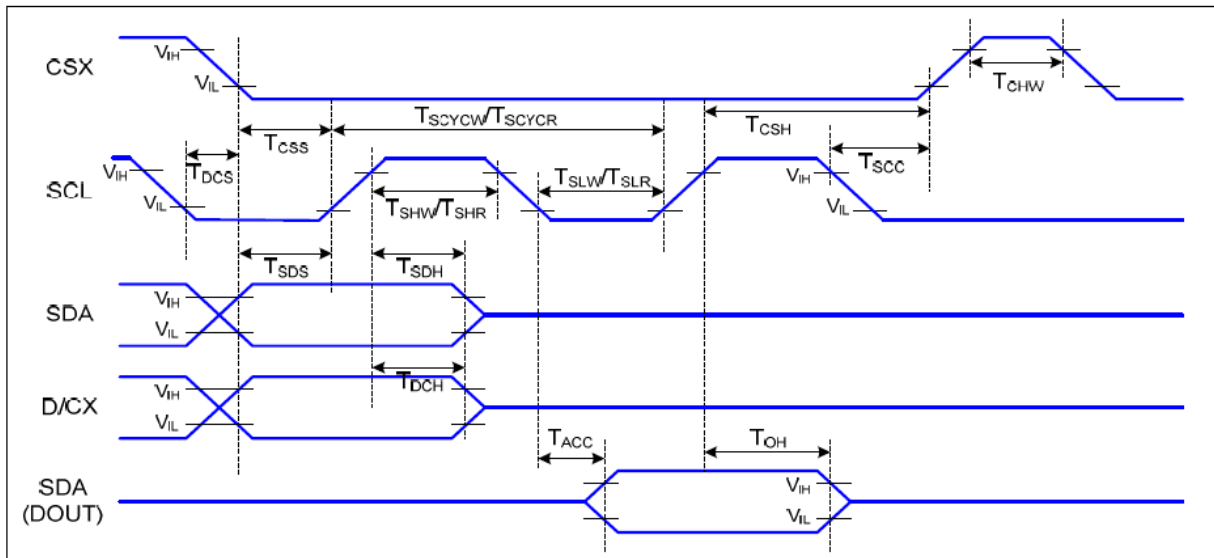


Figure 7 4-line Serial Interface Timing

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Ta=25 °C, VDDI=1.65~3.7V, VDD=2.5~4.8V

| Signal | Symbol | Parameter | MIN | MAX | Unit | Description |
|------------------------|--------|--------------------------------|-----|-----|------|---|
| CSX | TCSS | Chip Select Setup Time (Write) | 45 | | ns | |
| | TCSH | Chip Select Hold Time (Write) | 45 | | ns | |
| | TCSS | Chip Select Setup Time (Read) | 60 | | ns | |
| | TSCC | Chip Select Hold Time (Read) | 65 | | ns | |
| | TCHW | Chip Select "H" Pulse Width | 40 | | ns | |
| SCL | TSCYCW | Serial Clock Cycle (Write) | 66 | | ns | -Write Command & Data Ram |
| | TSHW | SCL "H" Pulse Width (Write) | 15 | | ns | |
| | TSLW | SCL "L" Pulse Width (Write) | 15 | | ns | |
| | TSCYCR | Serial Clock Cycle (Read) | 150 | | ns | -Read Command & Data Ram |
| | TSHR | SCL "H" Pulse Width (Read) | 60 | | ns | |
| | TSLR | SCL "L" Pulse Width (Read) | 60 | | ns | |
| D/CX | TDCS | D/CX Setup Time | 10 | | ns | |
| | TDCH | D/CX Hold Time | 10 | | ns | |
| SDA (DIN) (DOUT) | TSDS | Data Setup Time | 10 | | ns | For Maximum CL=30pF For Minimum CL=8pF |
| | TSDH | Data Hold Time | 10 | | ns | |
| | TACC | Access Time | 10 | 50 | ns | |
| | TOH | Output Disable Time | 15 | 50 | ns | |

Table 7 4-line Serial Interface Characteristics

9. Electro-optical Characteristics

| Item | Symbol | Conditions | Temp | Min. | Typ. | Max. | Unit | Note |
|--|-------------------------|--------------------------|------|----------------------------|------|---------------------------|------|-------|
| Response Time | T _R | $\theta = \phi = 0$ | 25°C | | TBD | TBD | msec | NOTE2 |
| | T _F | | | | TBD | TBD | | |
| Viewing Angle Range | $\phi = 0^\circ (6'')$ | $\phi = 90^\circ (3'')$ | | $\phi = 180^\circ (12'')$ | | $\phi = 270^\circ (9'')$ | | NOTE3 |
| $\theta (25^\circ\text{C}) \text{ CR} \geq 10$ | TBD | TBD | | TBD | | TBD | | NOTE3 |

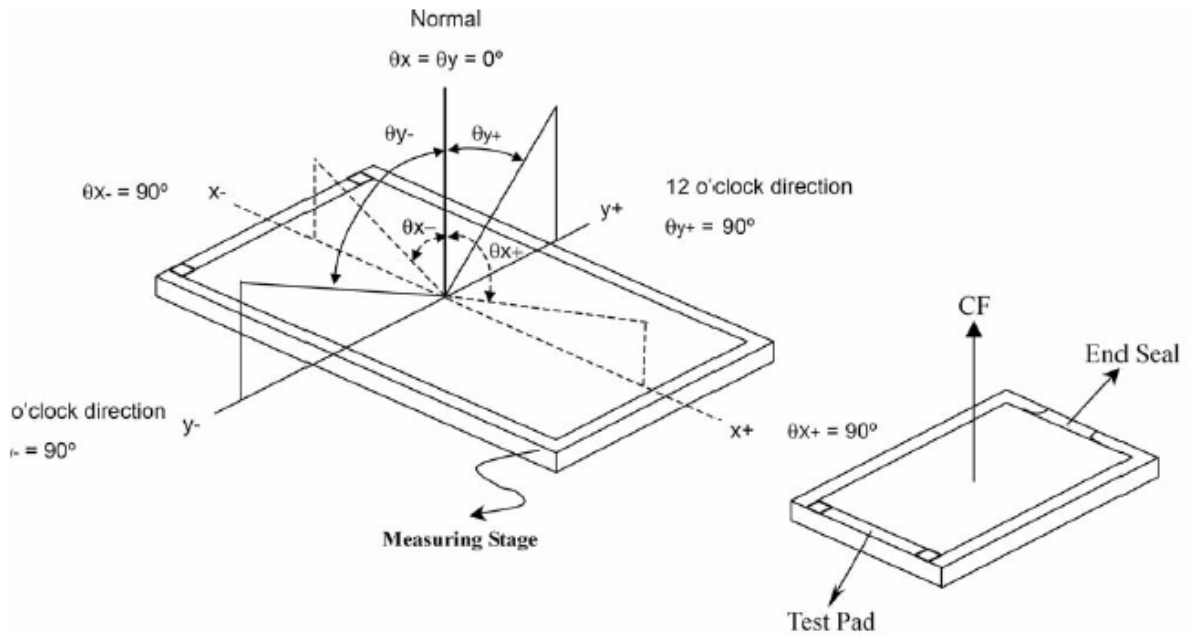
The above "viewing angle" is the measuring position with the largest contrast ratio. Not for good image quality. Viewing direction for good image quality is 12 O'clock.

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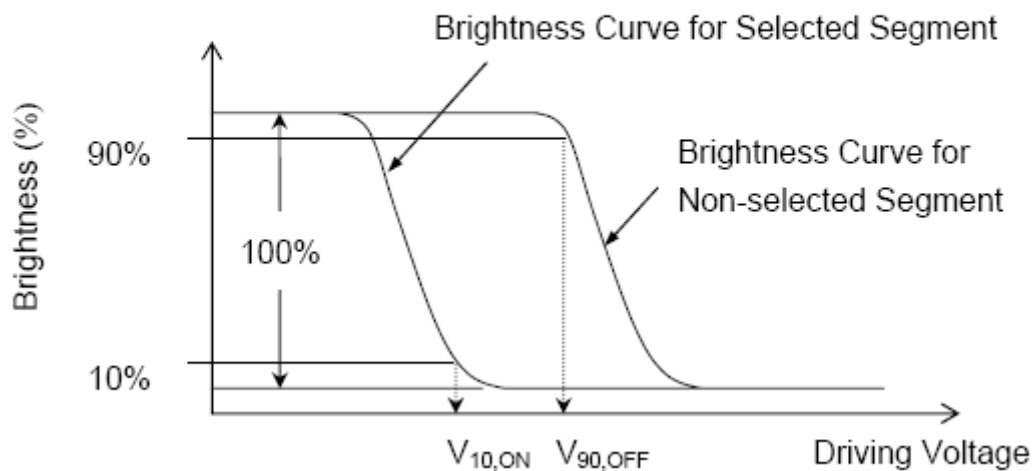
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- For panel only
- Electro-Optical Characteristics Test Method



$$V_{op} = (V_{10,ON} + V_{90,OFF})/2$$

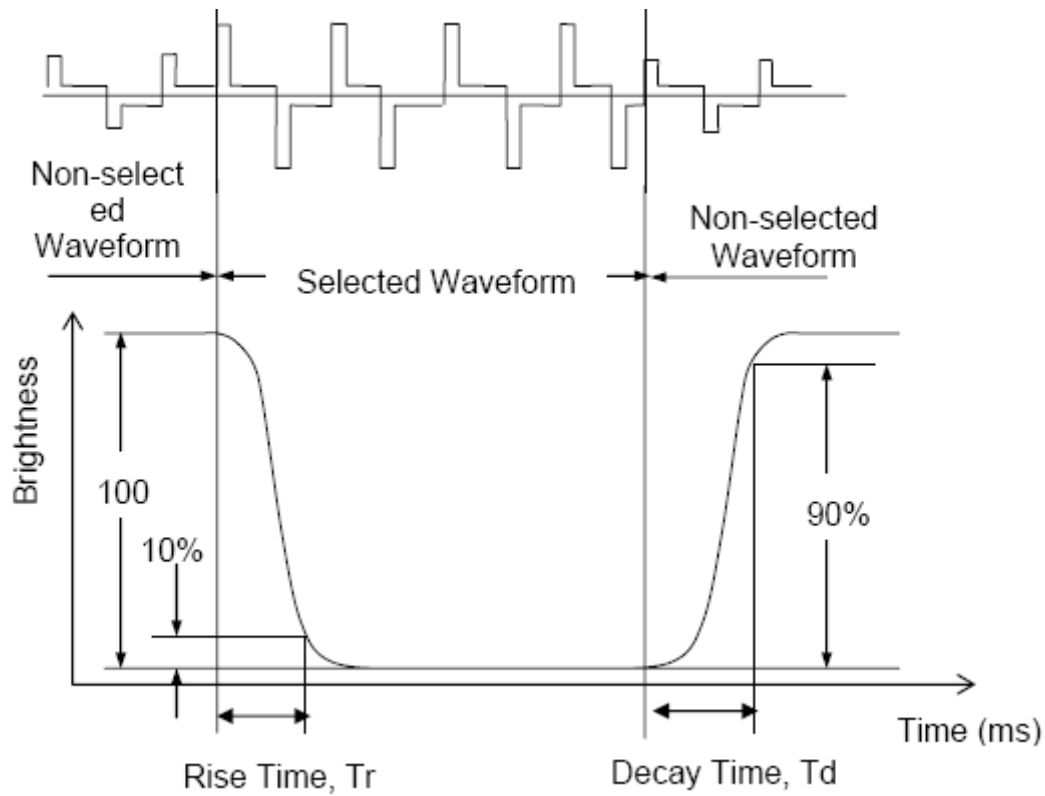


.Note2.Definition of Optical Response Time:

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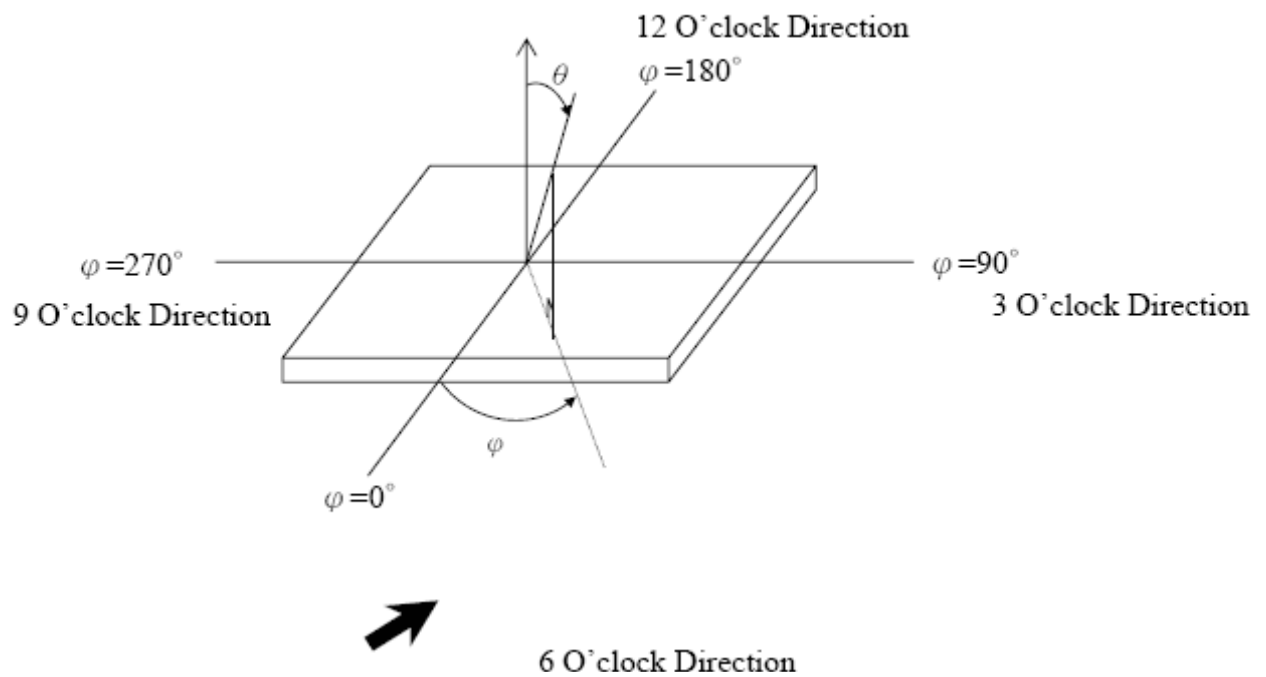


.Note3.Definition of Viewing Angle θ and ϕ :

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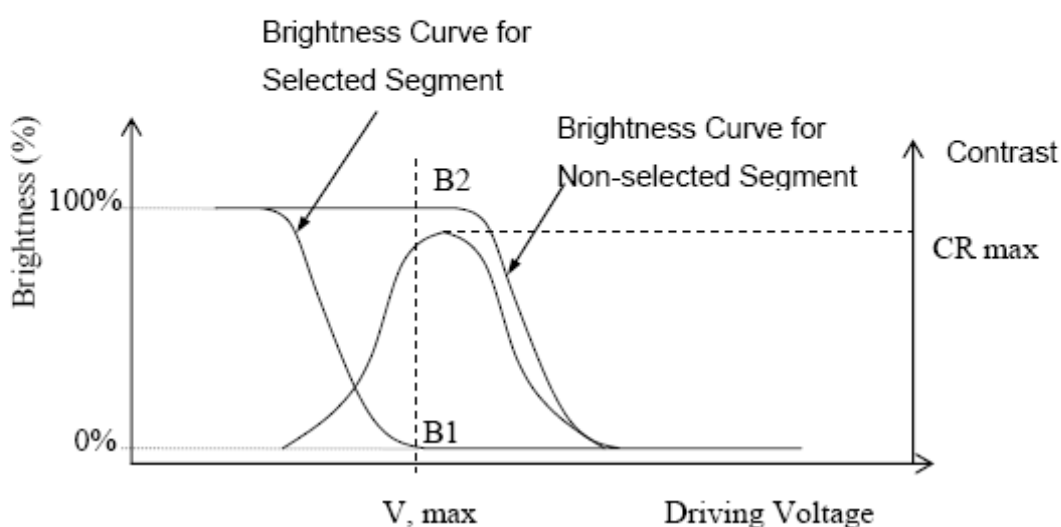
Note4.Definition of Contrast ratio (CR):

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$$CR = \frac{\text{Brightness of Non-selected Segment (B2)}}{\text{Brightness of Selected Segment (B1)}}$$



10. Reliability

10.1Mtbf

The LCD module shall be designed to meet a minimum MTBF value of 50000 hours with normal

10.2Test condition

| NO. | ITEM | CONDITION | CRITERION |
|-----|--|---|--|
| 1 | High Temperature Non-Operating Test | 80°C*240Hrs | 。 No Defect Of Operational Function In Room Temperature Are Allowable 。 IDD of LCM in Pre-and Post-Test Should Follow Specification |
| 2 | Low Temperature Non-Operating Test | -30°C*240Hrs | |
| 3 | High Temperature/Humidity Non Operating Test | 60°C*90%RH*240Hrs | |
| 4 | High Temperature Operating Test | 70°C*240Hrs | |
| 5 | Low Temperature Operating Test | -20°C*240Hrs | |
| 6 | Thermal Shock Test | -20°C (30Min) ↔ 70°C (30Min) *10CYCLES | |

Notes:

1. Judgments should be made after exposure in room temperature for two hours.
2. The distill water is used for the high temperature/humidity test.
3. The sample above is individually for every reliability tests condition.

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11. Inspection standards

1. AQL (Acceptable Quality Level)

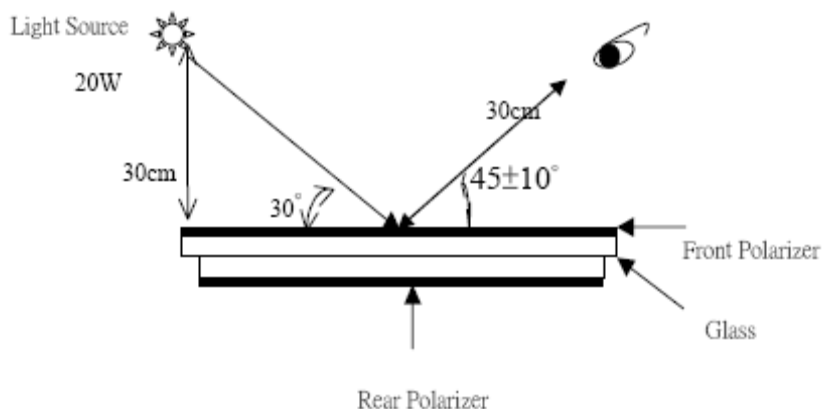
AQL of major and minor defect.

| | | |
|-----|--------------|--------------|
| | MAJOR DEFECT | MINOR DEFECT |
| AQL | 0.65 | 1.5 |

2. Basic conditions for inspection

The LCM face to us, in normal environment, the lux is 1000 ± 200 . (Darkroom's lux: 100 ± 50), About an angle of incidence 30° , a distance of 30 cm with an angle of $45 \pm 10^\circ$ to check the products without uncovering the film!

(As shown below)



3. Inspection item and criteria

3.1 Visual inspection criterion in immobility

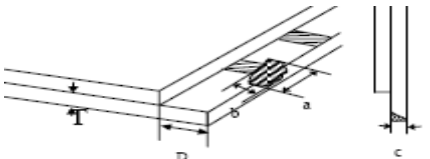
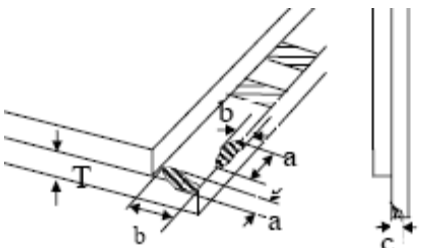
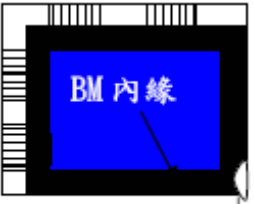
3.1.1 Glass defect

| NO | Defect item | Criteria | Remark |
|----|--|---|---------------------|
| 1 | Dimension Unconformity (Major defect) | By Engineering Drawing | |
| 2 | Cracks (Major defect) | 1. Linear cracks panel 2. Nonlinear crack contrast by limited sample 【Reject】 | |
| 3 | Glass extrude the conductive area (minor defect) | a: disregards and no influence assemblage. 1) $b \leq 1/3$ Pin width (non bonding) | A: Length, b: Width |

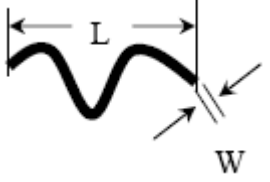
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| | | | |
|---|--|---|---|
| | | area) 2)bonding area \leq 0.5mm 【Accept】 | |
| 4 | Pin-side ,conductive area damaged (minor defect) | (a c: disregards) $b \leq 1/3$ of effective length for bonding electrode 【Accept】 | a: length, b: Width, c: Thickness  |
| 5 | Pin-side,non-conductive area damaged (minor defect) | 1)Damage area don't touch the ITO (Including contraposition mark, except scribing mark) 【Accept】 2) $C < T$ $b \leq BM/3$ of width 【Accept】 3) $c = T$ b not touch the seal glue 【Accept】 4)a disregards | a: Length, b: Width c: Thickness  |
| 6 | Non-pin-side damage (minor defect) | $c < T$ 1) b exceeds $1/3Bm$ 【Reject】 $c = T$ b not touch the seal glue 【Reject】 | c: Thickness b: width of  damage |

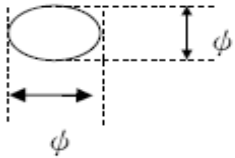
3.1.2LCD appearance defect(View area)

| NO | Defect item | Criteria | | Remark |
|----|---|--|-----------|---|
| | | Specification | Allowable | |
| 1 | Fiber、 glass cratch、 polarizer scratch/folded (minor defect) | $W \leq 0.03mm$ | disregard | note1:L: Length, W: Width note2: disregard if out of AA  |
| | | $0.03mm < W \leq 0.05mm$; $L \leq 3.0mm$ | 2 | |
| | | $0.05mm < W \leq 0.1mm$; $L \leq 3.0mm$ | 1 | |
| | | $W > 0.1mm$; $L > 3.0mm$ | 0 | |


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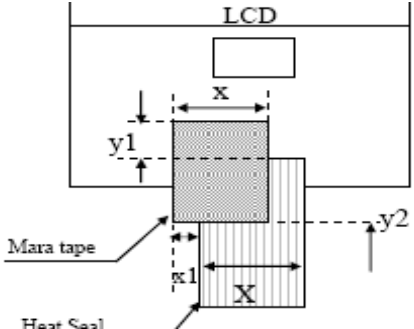
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| | | | | |
|---|---|---|-----------|---|
| 2 | Polarizer bubble、 concave and convex (minor defect) | $\phi \leq 0.2\text{mm}$ | disregard | note1: $\phi = (L+W)/2$, L:Length, W :Width note2:disregard if out of AA |
| | | $0.2\text{mm} < \phi \leq 0.3\text{mm}$ | 2 | |
| | | $0.3\text{mm} < \phi \leq 0.5\text{mm}$ | 1 | |
| | | $0.5\text{mm} < \phi$ | 0 | |
| 3 | Black dots、dirty dots、 impurities、eye winker (minor defect) | $\phi \leq 0.15\text{mm}$ | disregard | note2:disregard if out of AA  |
| | | $0.15\text{mm} < \phi \leq 0.25\text{mm}$ | 2 | |
| | | $0.25\text{mm} < \phi \leq 0.3\text{mm}$ | 1 | |
| | | $0.3\text{mm} < \phi$ | 0 | |
| 4 | Polarizer prick (minor defect) | $\phi \leq 0.1\text{mm}$ | disregard | note1: $\phi = (L+W)/2$, L=Length, W=Width note2:the distance between two dots>5mm |
| | | $0.1\text{mm} < \phi \leq 0.25\text{mm}$ | 3 | |
| | | $\phi > 0.25\text{mm}$ | 0 | |

3.1.3FPC

| NO | Defect item | Criteria | | Remark |
|----|--|-------------------------------------|-----------|---|
| 1 | Copper screen peel (minor defect) | Copper screen peel 【Reject】 | |  |
| 2 | No release tape or peel | No release tape or peel 【Reject】 | | |
| 3 | Dirty dot and impurity of FPC for customer using side (minor defect) | Specification | Allowable | Note1: Cannot have stride ITO impurities |
| | | $\phi \leq 0.25\text{mm}$ | 2 | |
| | | $\phi > 0.25$ | 0 | |

3.1.4Black tape & Mara tape

| NO | Defect item | Criteria | Remark |
|----|---|---|--|
| 1 | FPC or H/S black tape (minor defect) | 1. shift spec: 1) glue to the polarize 【Reject】 2) IC bare 【Reject】 2. left-and-right spec: 1) exceed of FPC edge or H-S edge 【Reject】 2) IC bare 【Reject】 |  |

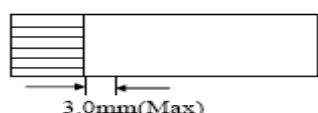
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| | | | |
|---|---|--|--|
| 2 | No black tape (major defect) | No black tape 【Reject】 | |
| 3 | Tape position mistake (minor defect) | Not by engineering drawing | |
| 4 | Mara tape defect (minor defect) | Peel before pulling the protecting film 【Reject】 | |

3.1.5 Silicon and Taffy glue

| NO | Defect item | Criteria | Remark |
|----|--|---|---|
| 1 | Quantity of silicon (major defect) | Uncover the ITO and circuit area 【Reject】 | note: compared by engineering |
| 2 | Taffy glue (major defect) | 1.Uncover the reveal copper area【Reject】 2.Cover layer 0.3mm(Min)~3.0mm(Max) 【Reject】 | note: if customer has special requirement, refer to the technical document  |
| 3 | Depth of glue covering (major defect) | Depth of glue covering overtop front Polarizer 【Reject】 | Except of the special requirement |

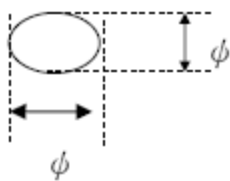
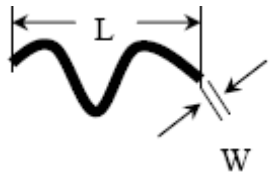
3.2Electrical criteria

| NO | Defect item | Criteria | Remark |
|----|--|--------------------------------------|-------------------|
| 1 | No display (major defect) | No display 【Reject】 | |
| 2 | Missing line (major defect) | Missing line 【Reject】 | |
| 3 | Seg-com light and dark (major defect) | Seg-com light and dark 【Reject】 | ND filter 2% test |
| 4 | No display in immobility (major defect) | No display in immobility 【Reject】 | |
| 5 | Flicker of Pattern (major defect) | Flicker of Pattern 【Reject】 | |
| 6 | Mura (major defect) | ND filter 2%test | |
| 7 | Over current | Over current | |

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| | | | | |
|----|---|---|-----------|---|
| | (major defect) | 【Reject】 | | |
| 8 | Voltage out of specification (major defect) | Voltage out of specification 【Reject】 | | |
| 9 | Pattern blur, error code (major defect) | Pattern blur, error code 【Reject】 | | |
| 10 | Dark light, Flicker (major defect) | Dark light, Flicker 【Reject】 | | |
| 11 | Black/white dots 、 Dirty dots、 eye winker (major defect) | Specification | Allowable | Note1:disregard if out of AA  |
| | | $\phi \leq 0.15\text{mm}$ | disregard | |
| | | $0.15\text{mm} < \phi \leq 0.25\text{mm}$ | 2 | |
| | | $0.25\text{mm} < \phi \leq 0.3\text{mm}$ | 1 | |
| | $0.3\text{mm} < \phi$ | 0 | | |
| 12 | Fiber、glass crutch、Polarizer scratch/folded (major defect) | $W \leq 0.03\text{mm}$ | disregard | Note1:L: Length, W: Width Note2: disregard if out of AA  |
| | | $0.03\text{mm} < W \leq 0.05\text{mm}$ $L \leq 3.0\text{mm}$ | 2 | |
| | | $0.05\text{mm} < W \leq 0.1\text{mm}$ $L \leq 3.0\text{mm}$ | 1 | |
| | | $W > 0.1\text{mm}; L > 3.0\text{mm}$ | 0 | |

12.Precautions for using LCD modules.

12.1 Safety

- (1)Do not swallow any liquid crystal ,even if there is no proof that liquid crystal is poisonous.
- (2)If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
- (3)If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

12.2Storage Conditions

- (4)Store the panel or module in a dark place where the temperature is $23 \pm 5^{\circ}\text{C}$ and the humidity is below $45 \pm 20\% \text{RH}$.
- (5)Store in anti-static electricity container.
- (6)Store in clean environment, free from dust, active gas, and solvent.

深圳市正晶浩电子有限公司

SHENZHEN ZJH DISPLAYER TECHNOLOGYCO., LTD

服务电话: 133 9284 8764 商务QQ: 15533 09801

(7) Do not place the module near organics solvents or corrosive gases.

(8) Do not crush, shake, or jolt the module.

12.3 Handling Precautions

(9) Avoid static electricity, which can damage the CMOS LSI.

(10) The polarizing plate of the display is very fragile, please handle it very carefully.

(11) Do not give external shock.

(12) Do not apply excessive force on the surface.

(13) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.

(14) Do not use ketonic solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.

(15) Do not operate it above the absolute maximum rating.

(16) Do not remove the panel or frame from the module.

12.4 Warranty

The period is within twelve months since the date of shipping out under normal using and storage conditions.

13. Factory

FACTORY NAME:

FACTORY ADDRESS:

FACTORY PHONE:

14. Revision history

| Version | Revise record | Date |
|---------|------------------|------------|
| v0.0 | Original version | 2014-06-16 |
| | | |
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