



深圳市晶彩智能有限公司

APPROVAL SHEET 承 认 书

| | |
|----------------------------------|---|
| Customer 客户名称 | |
| Part NO. 产品型号 | JC1060M070N-I |
| Product type 产品内容 | Mode: Transmissive type .Normally Black. TFT LCD Module LCD Module: Graphic 1024RGB*600Dot-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 | |

| | | |
|-----------|------------|-------------|
| Issued by | Checked by | Approved by |
| | | |

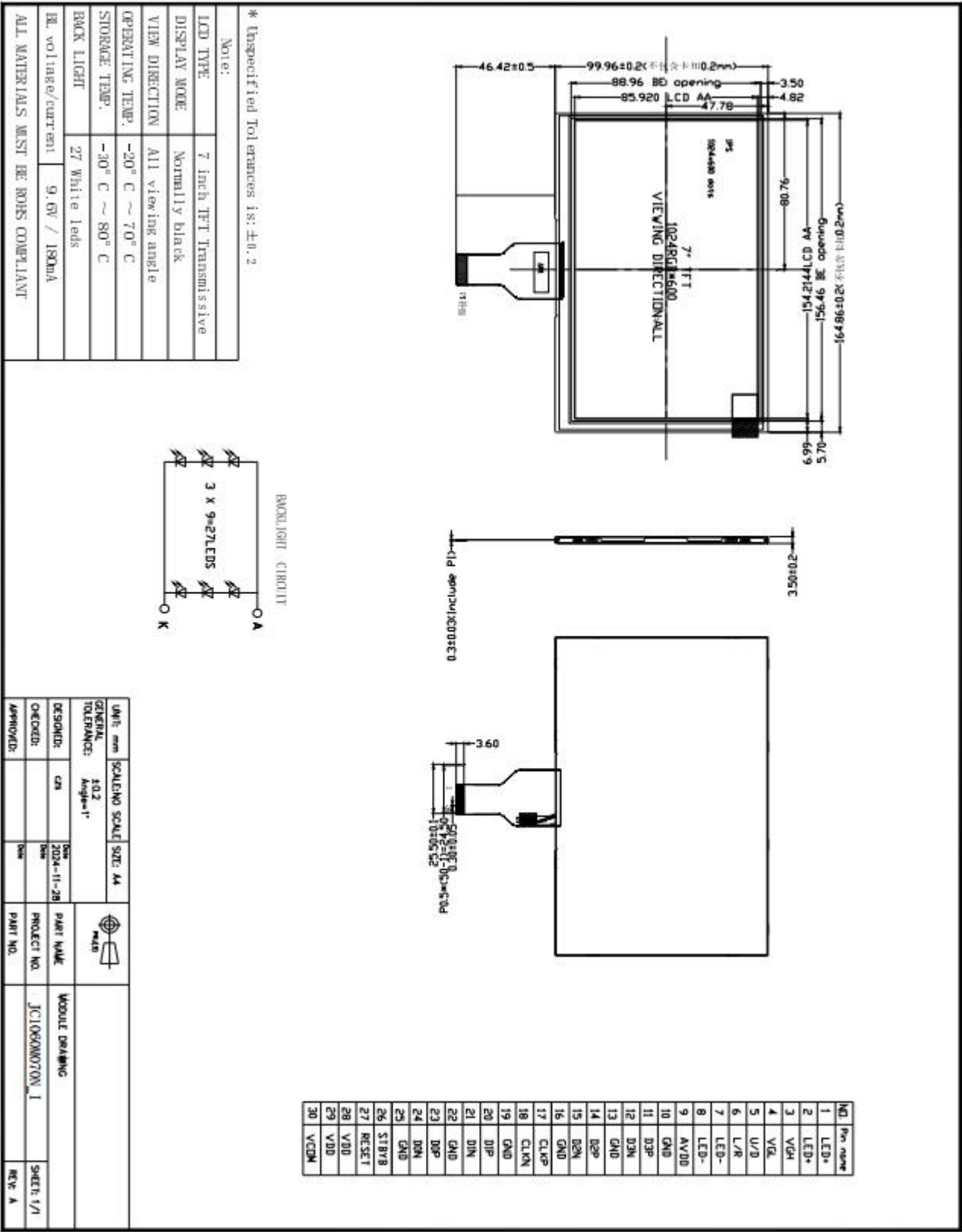


1. PHYSICAL DATA

| Item | Contents | Unit |
|---------------------|---------------------------|-----------------|
| LCD type | TFT TRANSMISSIVE | --- |
| Viewing direction | All | o'clock |
| Module size (W×H×T) | 165 × 100 × 3.5 | mm ³ |
| Active area(W×H) | 154.2144×85.92 | mm ² |
| Number of dots(W×H) | 1024(RGB) × 600 | dots |
| Pixel Pitch(W×H)) | 0.1506×0.1432 | mm |
| Driver IC | JD9165BA-DS | --- |
| Colors | 16.7M | --- |
| Backlight Type | 27 white leds 9.6V /180mA | --- |
| Interface Type | MIPI | --- |



2. Mechanical Dimension





3. Pin Descriptions

| Pin No. | Symbol | Functional | Notes |
|---------|-----------|------------------------------------|-------|
| 1 | LED+ | Back light LED+ | |
| 2 | LED+ | Back light LED+ | |
| 3 | LCD_VGH | Gate ON Voltage | |
| 4 | LCD_VGL | Gate OFF Voltage | |
| 5 | NC | NC | |
| 6 | NC | NC | |
| 7 | LED- | Back light LED- | |
| 8 | LED- | Back light LED- | |
| 9 | AVDD | Power for Analog Circuit | |
| 10 | GND | Ground | |
| 11 | MIPI_TDP3 | MIPI data input | |
| 12 | MIPI_TDN3 | MIPI data input | |
| 13 | GND | Ground | |
| 14 | MIPI_TDP2 | MIPI data input | |
| 15 | MIPI_TDN2 | MIPI data input | |
| 16 | GND | Ground | |
| 17 | MIPI_TDP | MIPI clock input | |
| 18 | MIPI_TDN | MIPI clock input | |
| 19 | GND | Ground | |
| 20 | MIPI_TDP1 | MIPI data input | |
| 21 | MIPI_TDN1 | MIPI data input | |
| 22 | GND | Ground | |
| 23 | MIPI_TDP0 | MIPI data input | |
| 24 | MIPI_TDN0 | MIPI data input | |
| 25 | GND | Ground | |
| 26 | STBYB | Standby mode, Normally pulled high | |
| 27 | RESET | Global reset pin | |
| 28 | VDD | Power supply for digital circuits | |
| 29 | VDD | Power supply for digital circuits | |
| 30 | VCOM | Common voltage | |



4. OPERATION SPECIFICATION

4.1 Absolute maximum ratings

| Parameter | Symbol | Min | Max | Unit |
|-----------------------|------------------|------|--------|------|
| Power supply1 | V _{DD} | -0.5 | +3.96 | V |
| Power supply2 | Avdd | -0.5 | +13.85 | V |
| Operating temperature | T _{OPR} | -20 | 70 | °C |
| Storage temperature | T _{STG} | -30 | 80 | °C |

4.2 Input driver voltage

| | |
|------------------|--------------|
| V _{GH} | 20 +/-0.5 V |
| V _{GL} | -7 +/-0.5 V |
| AVDD | 9.6V+/-0.5 V |
| V _{COM} | 3.7 +/-1 V |

Note: Please adjust Vcom to make the flicker level be minimum



5. DC ELECTRICAL CHARACTERISTICS

(VDD=VDD_IF=1.8V, AVDD=8 to 13.5V, GND=AGND=GND_IF=0V)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|-------------------------------------|--------|---|-----------|--------|----------|------|
| Low level input voltage | Vil | For the digital circuit | 0 | - | 0.3×VDD | V |
| High level input voltage | Vih | For the digital circuit | 0.7×VDD | - | VDD | V |
| Input leakage current | Ii | For the digital circuit | - | - | ±1 | μA |
| High level output voltage | Voh | Ioh= -400 μA | VDD - 0.4 | - | - | V |
| Low level output voltage | Vol | Iol= +400 μA | - | - | GND+0.4 | V |
| Pull low/high resistor | Ri | For the digital input pin @ VDD_IF=1.8V | 200K | 250K | 300K | ohm |
| Digital Operation current | Idd | Fclk=51.2MHz, VDD=VDD_IF=1.8V | - | TBD | - | mA |
| Digital HW Stand-by current | Ist1 | Clock and all functions are stopped | - | 50 | - | μA |
| Analog Operating Current | Idda | No load, Fclk=51.2MHz, @AVDD=13.5V, V1=13.4V, V14=0.1V | - | 10 | 12 | mA |
| Analog Stand-by current | Ist2 | No load, clock and all functions are stopped | - | 10 | 50 | μA |
| Input level of V1 ~ V7 | Vref1 | Gamma correction voltage input | 0.4*AVDD | - | AVDD-0.1 | V |
| Input level of V8 ~ V14 | Vref2 | Gamma correction voltage input | 0.1 | - | 0.6*AVDD | V |
| Output Voltage deviation | Vod1 | Vo = AGND+0.1V ~ AGND+0.5V and Vo = AVDD-0.5V ~ AVDD-0.1V | - | ±20 | ±35 | mV |
| Output Voltage deviation | Vod2 | Vo = AGND+0.5V ~ AVDD-0.5V | - | ±15 | ±20 | mV |
| Output Voltage Offset between Chips | Voc | Vo = AGND+0.5V ~ AVDD-0.5V | - | - | ±20 | mV |
| Dynamic Range of Output | Vdr | SO1 ~ 1536 | 0.1 | - | AVDD-0.1 | V |
| Sinking Current of Outputs | IOLy | SO1 ~ 1536; Vo=0.1V v.s 1.0V, AVDD=13.5V | 80 | - | - | uA |
| Driving Current of Outputs | IOHy | SO1 ~ 1536; Vo=13.4V v.s 12.5V, AVDD=13.5V | 80 | - | - | uA |
| Resistance of Gamma Table | Rg | Rn: Internal gamma resistor | 0.7*Rn | 1.0*Rn | 1.3*Rn | ohm |

(VDD=VDD_IF=1.8V, AVDD=8 to 13.5V, GND=AGND=GND_IF=0V, TA=-20℃ to 85℃)

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|-----------|------|------|------|------|
| MIPI Characteristics for High Speed Receiver | | | | | |
| Single-ended input low voltage | VILHS | -40 | - | - | mV |
| Single-ended input high voltage | VIHHS | - | - | 460 | mV |
| Common-mode voltage | VCDRXDC | 70 | - | 330 | mV |
| Differential input impedance | ZID | - | 100 | - | ohm |
| HS transmit differential voltage(VOD=VDP-VDN) | VOD | 140 | 200 | 250 | mV |
| MIPI Characteristics for Low Power Mode | | | | | |
| Pad signal voltage range | Vi | -50 | - | 1350 | mV |
| Ground shift | VGNDSh | -50 | - | 50 | mV |
| Logic 0 input threshold | VIL | 0 | - | 550 | mV |
| Logic 1 input threshold | VIH | 880 | - | 1350 | mV |
| Input hysteresis | VHYST | 25 | - | - | mV |
| Output low level | Vol | -50 | - | 50 | mV |
| Output high level | VOH | 1.1 | 1.2 | 1.3 | V |
| Output impedance of Low Power Transmitter | ZOLP | 80 | 100 | 125 | ohm |
| Logic 0 contention threshold | VILCD,MAX | - | - | 200 | mV |
| Logic 0 contention threshold | VIHCD,MIN | 450 | - | - | mV |

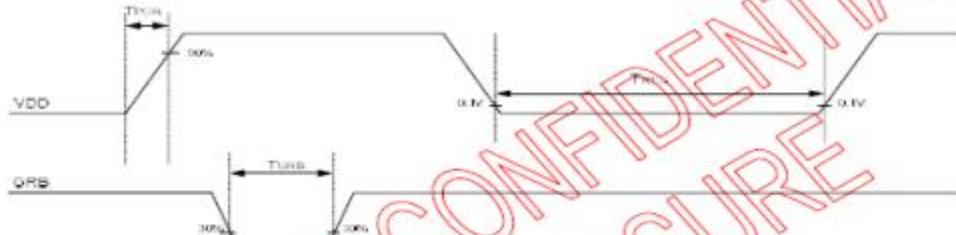


6. AC ELECTRICAL CHARACTERISTICS

(VDD=VDD_IF=1.8V, AVDD=8 to 13.5V, GND=AGND=GND_IF=0V, TA=-20 to +85°C)

VDD/GRB AC characteristic

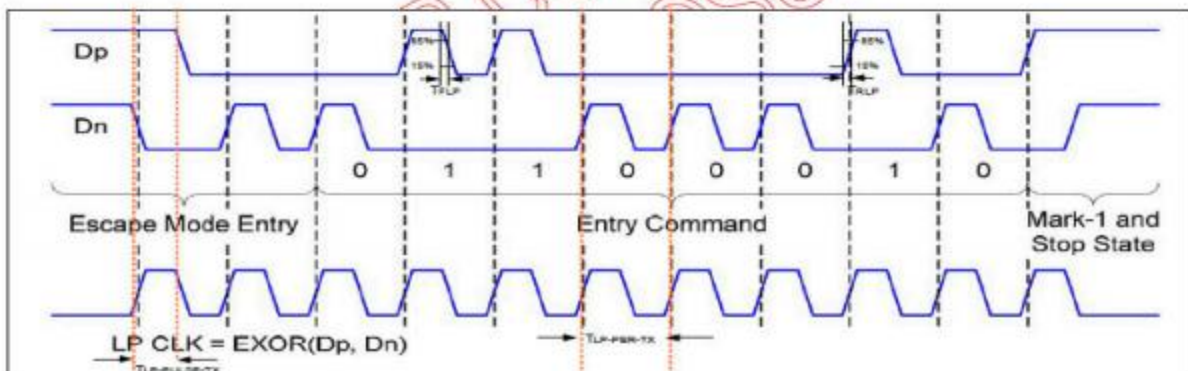
| Parameter | Symbol | Min. | Typ. | Max. | Unit | Condition |
|------------------------|------------------|------|------|------|------|-------------------|
| VDD power slew rate | T _{POR} | - | - | 20 | ms | From 0 to 90% VDD |
| GRB active pulse width | T _{GRB} | 1 | - | - | ms | VDD=VDD_IF=1.8V |
| VDD resettle time | T _{RES} | 1 | - | - | s | |



3-wire interface AC characteristic

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|--------------------------------|-------------------|------|------|------|------|
| CSB falling to SCL rising time | T _{SCL} | 200 | - | - | ns |
| SCL pulse high period | T _{ICWH} | 100 | - | - | ns |
| SCL pulse low period | T _{ICWL} | 100 | - | - | ns |
| SCL pulse width | T _{ICWP} | 250 | - | - | ns |
| SDA data input setup time | T _{ISU} | 100 | - | - | ns |
| SDA data input hold time | T _{IHD} | 100 | - | - | ns |
| SCL to CSB rising time | T _{ISC} | 250 | - | - | ns |
| CSB rising to failing time | T _{ICD} | 1 | - | - | us |

| Parameter | Symbol | Min | Typ | Max | Units | Notes |
|--|-------------------------------------|-----|-----|-----|-------|-------|
| 15%~85% rising time and falling time | T _{RLP} / T _{FLP} | - | - | 25 | ns | - |
| 30%~85% rising time and falling time | T _{TROT} | - | - | 35 | ns | - |
| Pulse width of LP exclusive-OR clock | T _{LP-PULSE-TX} | 40 | - | - | ns | - |
| First LP EXOR clock pulse after STOP state or Last pulse before stop state | | 20 | - | - | ns | - |
| All other pulses | | 20 | - | - | ns | - |
| Period of the LP EXOR clock | T _{LP-PER-TX} | 90 | - | - | mV/ns | - |
| Slew Rate @CLOAD =0pF | $\delta V / \delta t_{SR}$ | 30 | - | 500 | mV/ns | - |
| Slew Rate @CLOAD =5pF | | 30 | - | 200 | mV/ns | - |
| Slew Rate @CLOAD =20pF | | 30 | - | 150 | mV/ns | - |
| Slew Rate @CLOAD =70pF | | 30 | - | 100 | mV/ns | - |
| Load Capacitance | T _{RLP} | - | - | 70 | pF | - |





7. Data input format

DE mode

| Parameter | Symbol | Value | | | Unit |
|---------------------------------|----------|-------|------|------|------|
| | | Min. | Typ. | Max. | |
| DCLK frequency @Frame rate=60hz | fclk | 40.8 | 51.2 | 67.2 | Mhz |
| Horizontal display area | thd | 1024 | | | DCLK |
| HSYNC period time | th | 1114 | 1344 | 1400 | DCLK |
| HSYNC blanking | thb+thfp | 90 | 320 | 376 | DCLK |
| Vertical display area | Tvd | 600 | | | H |
| VSYNC period time | Tv | 610 | 635 | 800 | H |
| VSYNC blanking | Tvb+Tvfp | 10 | 35 | 200 | H |

HV mode

Horizontal input timing

| Parameter | Symbol | Value | | | Unit |
|---------------------------------|--------|-------|------|------|------|
| Horizontal display area | thd | 1024 | | | DCLK |
| DCLK frequency@ Frame rate=60hz | fclk | Min. | Typ. | Max. | Mhz |
| | | 44.9 | 51.2 | 63 | |
| 1 Horizontal Line | th | 1200 | 1344 | 1400 | DCLK |
| HSYNC pulse width | Min. | 1 | | | |
| | Typ. | — | | | |
| | Max. | 140 | | | |
| HSYNC blanking | thb | 160 | 160 | 160 | |
| HSYNC front porch | thfp | 16 | 160 | 216 | |

HV mode

Vertical input timing

| Parameter | Symbol | Value | | | Unit |
|-----------------------|--------|-------|------|------|------|
| | | Min. | Typ. | Max. | |
| Vertical display area | tvd | 600 | | | H |
| VSYNC period time | tv | 624 | 635 | 750 | H |
| VSYNC pulse width | tpw | 1 | — | 20 | H |
| VSYNC back porch | tvb | 23 | 23 | 23 | H |
| VSYNC front porch | tvfp | 1 | 12 | 127 | H |



8. Backlight Characteristic

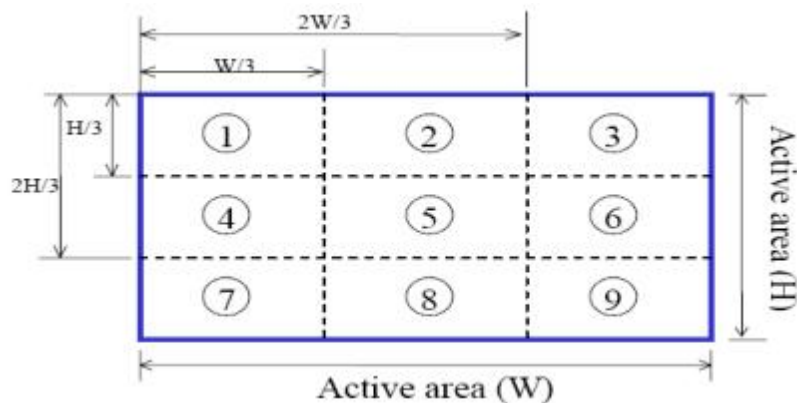
| Item | Symbol | Min | Typical | Max | Unit |
|-----------------------------------|-----------|-----|---------|-----|------|
| LED module Forward voltage | V_{LED} | -- | 9.3 | 9.6 | V |
| LED module current | I_{LED} | -- | 180 | -- | mA |
| LCM Surface Luminance ★1 | L_s | -- | TBD | -- | mcd |
| LCM Surface brightness uniform ★2 | L_D | 80 | -- | -- | % |

★ 1 Test condition is:

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

★2 Uniform measure condition:

- (1) Measure 9 point. Measure location show below;
- (2) $\text{Uniform} = (\text{Min. brightness} / \text{Max. brightness}) * 100\%$
- (3) Best Contrast.



9. Electro-optical Characteristics

| Parameter | | Symbol | Condition | Min. | Typ. | Max | Unit | Remark |
|----------------------|------|-----------------|-----------|------|------|-----|------|--------|
| Viewing angle range | Hor. | φ3 | CR≥10 | 80 | 85 | . | Deg. | |
| | | φ9 | | 80 | 85 | | Deg. | |
| | Ver. | ⊙12 | | 80 | 85 | | Deg. | |
| | | ⊙6 | | 80 | 85 | | Deg. | |
| Color gamut(C light) | | | | | 50 | | % | |
| Contrast ratio | | T(%) | φ0° | 600 | 800 | | | |
| Response Time | | T _{RT} | Temp=25℃ | | 25 | 40 | ms | |



10. Reliability

10.1 Mtbf

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

10.2 Test condition

| NO. | ITEM | CONDITION | CRITERION |
|-----|--|---|---|
| 1 | High Temperature Non-Operating Test | 80°C*120Hrs | No Defect Of Operational Function In Room Temperature Are Allowable |
| 2 | Low Temperature Non-Operating Test | -30°C*120Hrs | |
| 3 | High Temperature/Humidity Non Operating Test | 60°C*75%RH*120Hrs | |
| 4 | High Temperature Operating Test | 70°C*120Hrs | |
| 5 | Low Temperature Operating Test | -20°C*120Hrs | |
| 6 | Thermal Shock Test | -10 °C (30Min) - 50 °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.

11. Inspection standards

1. AQL(Acceptable Quality Level)

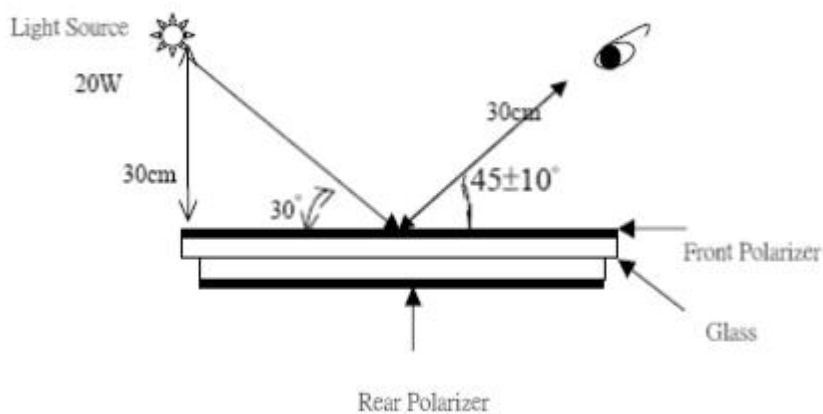
AQL of major and minor defect.

| | 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 degree to check the products without uncovering the film!

(As shown below)



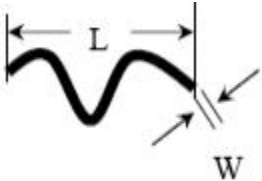
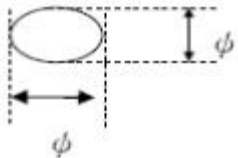


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3. Inspection item and criteria

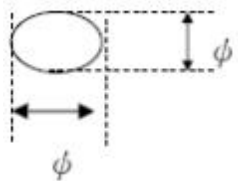
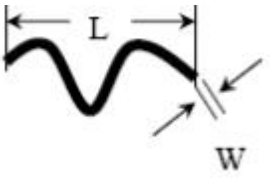
3.1 Visual inspection criterion in immobility

3.1.1 LCD appearance defect (View area)

| NO | Defect item | Criteria | | Remark |
|----|---|--|-----------|---|
| 1 | Fiber、glass cratch、polarizer scratch/folded (minor defect) | Specification | Allowable | note1:L: Length, W: Width note2: disregard if out of AA  |
| | | $W \leq 0.03 \text{ mm}$ | disregard | |
| | | $0.03 \text{ mm} < W \leq 0.05 \text{ mm};$ $L \leq 3.0 \text{ mm}$ | 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 | |
| 2 | Polarizer bubble、 concave and convex (minor defect) | $\varphi \leq 0.2 \text{ mm}$ | disregard | note1: $\varphi = (L+W)/2$, L: Length, W :Width note2:disregard if out of AA |
| | | $0.2 \text{ mm} < \varphi \leq 0.3 \text{ mm}$ | 2 | |
| | | $0.3 \text{ mm} < \varphi \leq 0.5 \text{ mm}$ | 1 | |
| | | $0.5 \text{ mm} < \varphi$ | 0 | |
| 3 | Black dots、dirty dots、 impurities、eye winker (minor defect) | $\varphi \leq 0.15 \text{ mm}$ | disregard | note2:disregard if out of AA  |
| | | $0.15 \text{ mm} < \varphi \leq 0.25 \text{ mm}$ | 2 | |
| | | $0.25 \text{ mm} < \varphi \leq 0.3 \text{ mm}$ | 1 | |
| | | $0.3 \text{ mm} < \varphi$ | 0 | |
| 4 | Polarizer prick (minor defect) | $\varphi \leq 0.1 \text{ mm}$ | disregard | note1: $\varphi = (L+W)/2$, L=Length, W=Width note2:the distance between two dots>5 mm |
| | | $0.1 \text{ mm} < \varphi \leq 0.25 \text{ mm}$ | 3 | |
| | | $\varphi > 0.25 \text{ mm}$ | 0 | |



3.2 Electrical 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 (major defect) | Over current 【 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.

12.2 Storage 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.
- (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.