# MAXEN ELECTRONICS LIMITED

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# SPECIFICATION

## Model: MX-B101HR50-TNX20

**For Customer's Acceptance:**

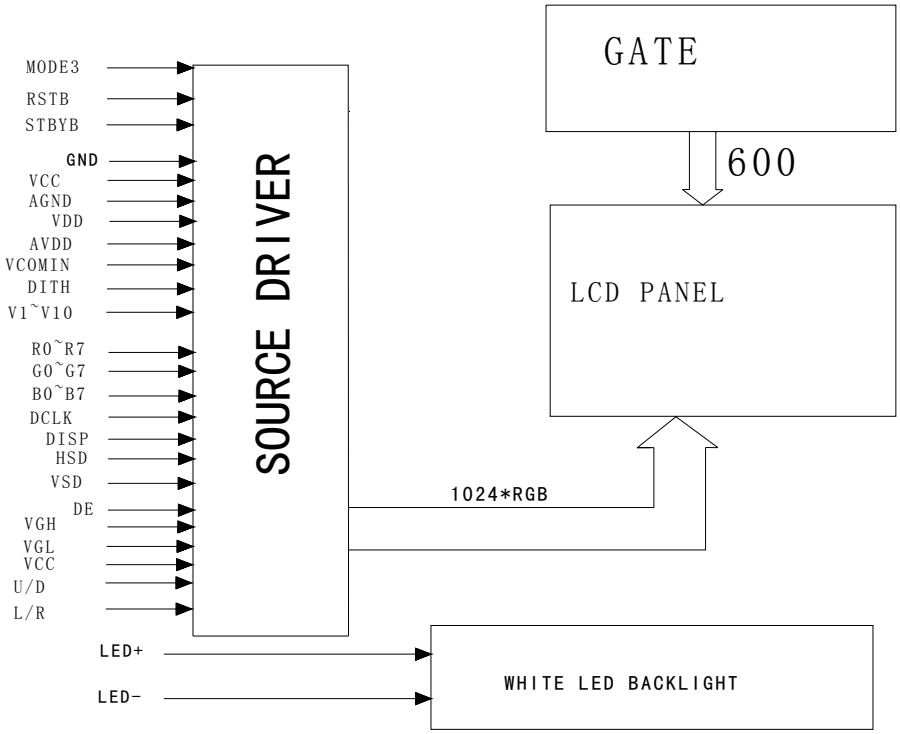
| Approved By | Comment |
|---|---|
| | |

| PREPARED | CHECKED | VERIFIED BY QA DEPT | VERIFIED BY R&D DEPT |
|---|---|---|---|
| | | | |

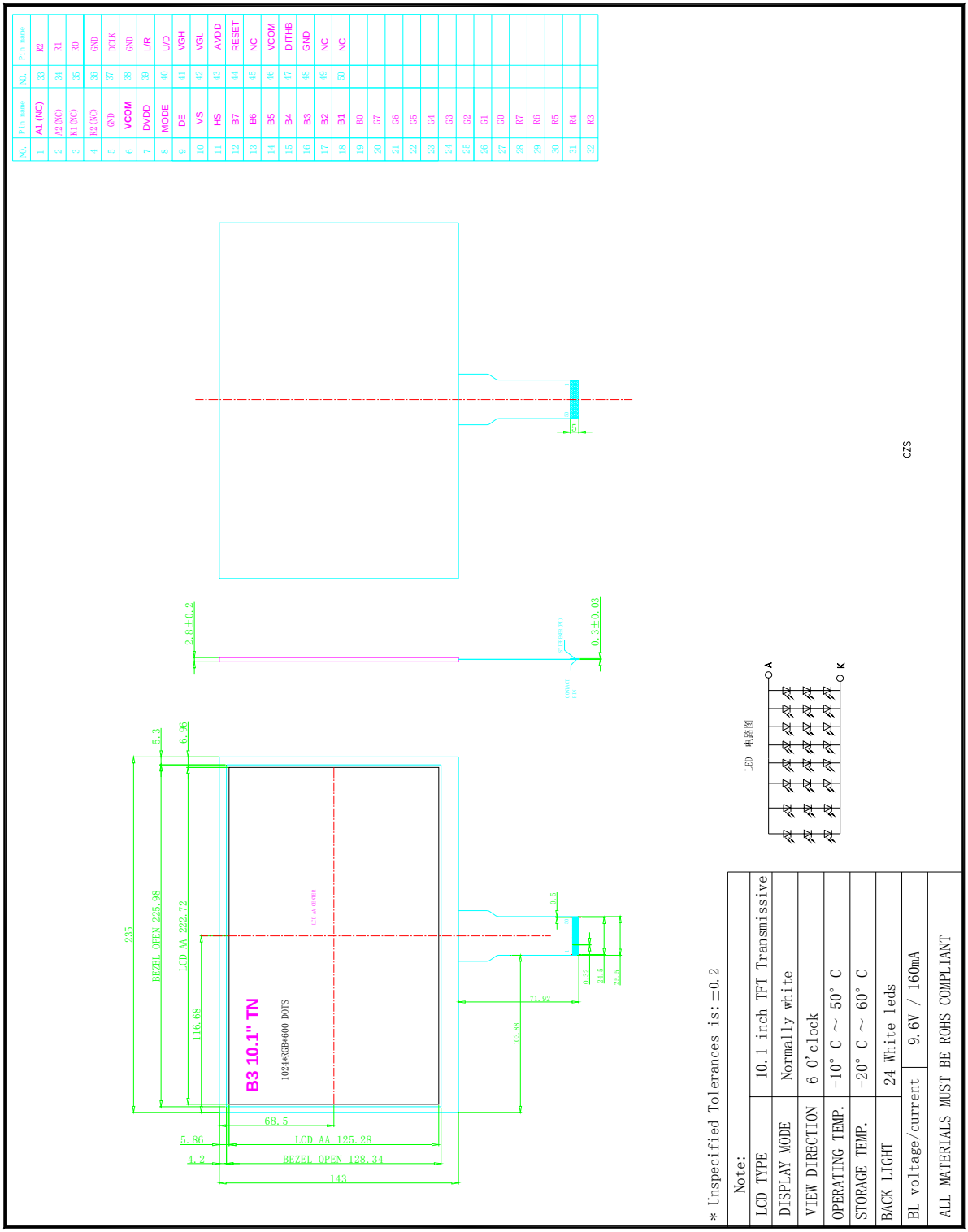
## 1. PHYSICAL DATA

| Item | Contents | Unit |
|---|---|---|
| LCD type | TFT TRANSMISSIVE | --- |
| Viewing direction | 6 | o'clock |
| Module size (W×H×T) | 235 x 143 x 2.8 | $mm^3$ |
| Active area(W×H) | 222.72×125.28 | $mm^2$ |
| Number of dots(W×H) | 1024(RGB) × 600 | dots |
| Pixel Pitch(H×V) | 0.2175×0.2088 | mm |
| Driver IC | EK79001 | --- |
| Colors | 16.7M | --- |
| Backlight Type | 24 white leds 9.6/160mA | --- |
| Interface Type | RGB | --- |

## 2. BLOCK DIAGRAM



## 3.Mechanical Dimension




| NO. | Pin name | NO. | Pin name | NO. | Pin name | NO. | Pin name |
|---|---|---|---|---|---|---|---|
| 1 | A1 (NC) | 2 | A2 (NC) | 3 | K1 (NC) | 4 | K2 (NC) |
| 5 | GND | 6 | VCOM | 7 | DVDD | 8 | MODE |
| 9 | DE | 10 | VS | 11 | HS | 12 | B7 |
| 13 | B6 | 14 | B5 | 15 | B4 | 16 | B3 |
| 17 | B2 | 18 | B1 | 19 | B0 | 20 | G7 |
| 21 | G6 | 22 | G5 | 23 | G4 | 24 | G3 |
| 25 | G2 | 26 | G1 | 27 | G0 | 28 | R7 |
| 29 | R6 | 30 | R5 | 31 | R4 | 32 | R3 |
| 33 | R2 | 34 | R1 | 35 | R0 | 36 | GND |
| 37 | DCLK | 38 | GND | 39 | L/R | 40 | U/D |
| 41 | VGH | 42 | VGL | 43 | AVDD | 44 | RESET |
| 45 | NC | 46 | VCOM | 47 | DITHB | 48 | GND |
| 49 | NC | 50 | NC | | | | |

| Note: | |
|---|---|
| LCD TYPE | 10.1 inch TFT Transmissive |
| DISPLAY MODE | Normally white |
| VIEW DIRECTION | 6 O'clock |
| OPERATING TEMP. | -10° C ~ 50° C |
| STORAGE TEMP. | -20° C ~ 60° C |
| BACK LIGHT | 24 White leds |
| BL voltage/current | 9.6V / 160mA |
| ALL MATERIALS MUST BE ROHS COMPLIANT | |

## 4. Pin Descriptions

| Pin No. | Symbol | Functional |
|---|---|---|
| 1 | LED A | LED Anode |
| 2 | LED A | LED Anode |
| 3 | LED K | LED Cathode |
| 4 | LED K | LED Cathode |
| 5 | GND | Digital Ground |
| 6 | VCOM | For external VCOM DC input |
| 7 | DVDD | Digital Power |
| 8 | MODE | DE/SYNC mode select<br>MODE=H: DE mode( normally pull high)<br>MODE=L: HSD/VSD mode |
| 9 | DE | Data enable signal |
| 10 | VSYNC | Vertical sync input.Negative polarity |
| 11 | HSYNC | Horizontal sync input.Negative polarity |
| 12~19 | B7~B0 | Blue data Input |
| 20~27 | G7~G0 | Green data Input |
| 28~35 | R7~R0 | Red data Input |
| 36 | GND | Digital Ground |
| 37 | DCLK | Clock input |
| 38 | GND | Digital Ground |
| 39 | L/R | Source right or left sequence control<br>SHLR=H: right shift, Left → Right<br>SHLR=L: left right, Right → Left |
| 40 | U/D | Gate up or down scan control<br>UPDN=H: up shift, Down → Up<br>UPDN=L: down shift, Up → Down |
| 41 | VGH | Positive Power for TFT |
| 42 | VGL | Negative Power for TFT |
| 43 | AVDD | Analog Power |
| 44 | RSTB | Global reset pin.Active low to enter reset state<br>Suggest to connecting with an RC reset circuit for stability.<br>Normally pull high.（RC circuit :R=10KΩ， C=1uF）） |
| 45 | NC | Not connect |
| 46 | VCOM | For external VCOM DC input |
| 47 | DITHB | Dithering setting |
| 48 | GND | Digital Ground |
| 49 | NC | Not connect |
| 50 | NC | Not connect |

## 5. ABSOLUTE MAXIMUM RATINGS

5.1 (GND=AGND=0V)

| 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 | ℃ |
| Storage temperature | $T_{STG}$ | -30 | 80 | ℃ |

5.2 Input voltage refer list

| Parameter | Symbol | Value | Unit | Remarks |
|---|---|---|---|---|
| TFT Gate ON Voltage | VGH | 21 | V | |
| TFT Gate Off Voltage | VGL | -8 | V | |
| TFT Common Electrode Voltage | VCOM | 3.8 | V | NOTE |
| Analog Power Supply Voltage | AVDD | 10.85 | V | |

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

## 6. DC ELECTRICAL CHARACTERISTICS

| 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=3.3V | 200K | 250K | 300K | ohm |
| Digital Operation current | Idd | Fclk=65 MHz, FLD=50KHz, VDD=3.3V | - | 15 | 25 | mA |
| Digital Stand-by current | Ist1 | Clock and all functions are stopped | - | 10 | 50 | μA |
| Analog Operating Current | Idda | No load, Fclk=65MHz, FLD=50KHz @ AVDD=10V,V1=8V, V14=0.4V | - | 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 = AVSS+0.1V ~ AVSS+0.5V and Vo = AVDD-0.5V ~ AVDD-0.1V | - | ±20 | ±35 | mV |
| Output Voltage deviation | Vod2 | Vo = AVSS+0.5V ~ AVDD-0.5V | - | ±15 | ±20 | mV |
| Output Voltage Offset between Chips | Voc | Vo = AVSS+0.5V ~ AVDD-0.5V | - | - | ±20 | mV |
| Dynamic Range of Output | Vdr | SO1 ~ SO1536 | 0.1 | - | AVDD-0.1 | V |
| Sinking Current of Outputs | IOLy | SO1 ~ SO1536; Vo=0.1V v.s 1.0V , AVDD=13.5V | 80 | - | - | uA |
| Driving Current of Outputs | IOHy | SO1 ~ SO1536; 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 |

## 7. Parallel RGB input timing table

### Resolution:1024x600

DE mode

| 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(1)

| HV mode<br>Horizontal input timing | | | | | | |
|---|---|---|---|---|---|---|
| Parameter | | Symbol | Value | | | Unit |
| Horizontal display area | | thd | 1024 | | | DCLK |
| DCLK frequency@Frame rate=60hz | | fclk | Min. | Typ. | Max. | |
| | | | 44.9 | 51.2 | 63 | Mhz |
| 1 Horizontal Line | | th | 1200 | 1344 | 1400 | DCLK |
| HSYNC pulse width | Min. | thpw | 1 | | | |
| | Typ. | | — | | | |
| | Max. | | 140 | | | |
| HSYNC back porch | | thbp | 160 | 160 | 160 | |
| HSYNC front porch | | thfp | 16 | 160 | 216 | |

HV mode(2)

| 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 | tvpw | 1 | — | 20 | H |
| VSYNC back porch | tvb | 23 | 23 | 23 | H |
| VSYNC front porch | tvfp | 1 | 12 | 127 | H |

## 8. TTL MODE AC ELECTRICAL CHARACTERISTICS

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| VDD Power On Slew rate | TPOR | From 0V to 90% VDD | 1 | - | 20 | ms |
| RST pulse width | TRST | DCLK = 65MHz | 50 | - | - | us |
| DCLK cycle time | Tcph | - | 14 | - | - | ns |
| DCLK pulse duty | Tcwh | - | 40 | 50 | 60 | % |
| VSD setup time | Tvst | - | 5 | - | - | ns |
| VSD hold time | Tvhd | - | 5 | - | - | ns |
| HSD setup time | Thst | - | 5 | - | - | ns |
| HSD hold time | Thhd | - | 5 | - | - | ns |
| Data set-up time | Tdsu | D0[7:0], D1[7:0], D2[7:0] to DCLK | 5 | - | - | ns |
| Data hold time | Tdhd | D0[7:0], D1[7:0], D2[7:0] to DCLK | 5 | - | - | ns |
| DE setup time | Tesu | - | 5 | - | - | ns |
| DE hold time | Tehd | - | 5 | - | - | ns |
| Output stable time | Tsst | Dual gate | - | - | 3 | us |



## 9. Backlight Characteristic

| Item | Symbol | Min | Typical | Max | Unit |
|---|---|---|---|---|---|
| LED module Forward voltage | $V_{LED}$ | -- | 9.6 | -- | V |
| LED module current | $I_{LED}$ | -- | 160 | -- | mA |
| L/G Surface Luminance ★1 | $L_S$ | 200 | 230 | -- | mcd |
| LCM Surface brightness uniform ★2 | $L_D$ | 80 | -- | -- | % |

**★ 1 Test condition is:**

**(a) Center point on active area.**

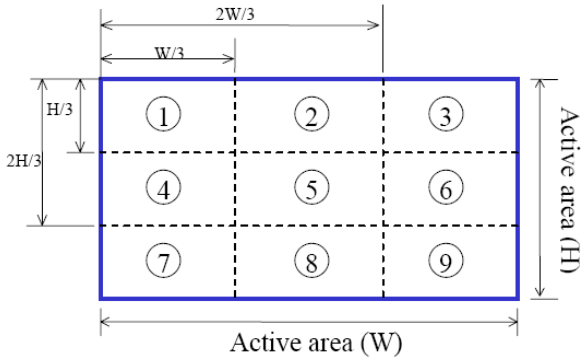
**(b)Best Contrast.**

**★2 Uniform measure condition:**

**(1)Measure 9 point. Measure location show below;**

**(2)Uniform=(Min. brightness /Max. brightness)*100%**

**(3)Best Contrast.**



## 10.Electro-optical Characteristics

| Parameter | | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| Viewing angle range | Hor. | Φ3 | CR≥10 | | 50 | | Deg | |
| | | Φ9 | | | 50 | | Deg | |
| | Ver. | Φ12 | | | 40 | | Deg | |
| | | Φ6 | | | 50 | | Deg | |
| Color gamut (C light) | | | | | 50 | | % | |
| Luminance Contrast ratio | | T(%) | Φ0° | | 600 | | | |
| Response Time | | TRT | Temp=25° C | | 8 | | ms | |

## 11. Reliability

### 11.1 Mtbf

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

### 11.2 Test condition

| NO. | ITEM | CONDITION | CRITERION |
|---|---|---|---|
| 1 | High Temperature Non-Operating Test | 60℃*120Hrs | No Defect Of Operational Function In Room Temperature Are Allowable |
| 2 | Low Temperature Non-Operating Test | -20℃*120Hrs | |
| 3 | High Temperature/Humidity Non Operating Test | 60℃*75%RH*240Hrs | |
| 4 | High Temperature Operating Test | 50℃*120Hrs | |
| 5 | Low Temperature Operating Test | -10℃*120Hrs | |
| 6 | Thermal Shock Test | -10℃(30Min) - 50℃(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.

## 12. Inspection standards

1.AQL(Acceptable Quality Level

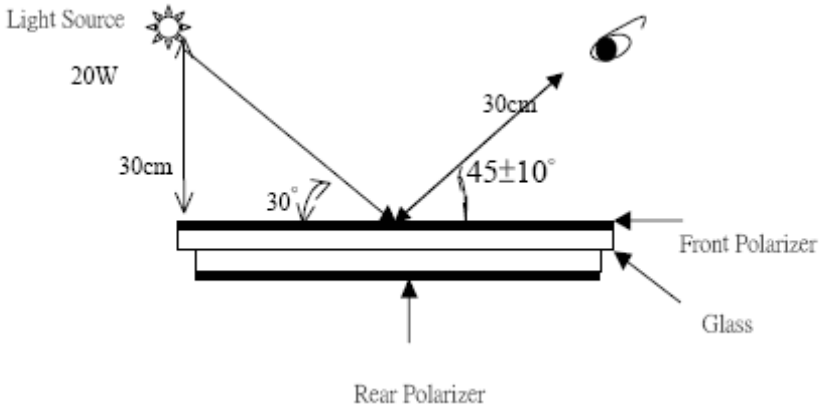
AQL of major and minor defect.

| | 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!

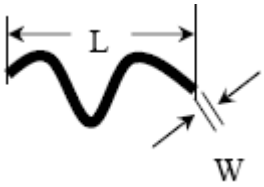
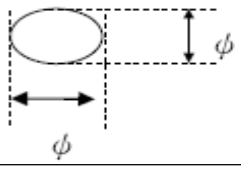
**(As shown below)**



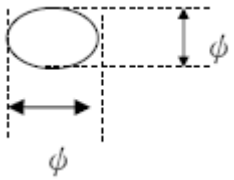
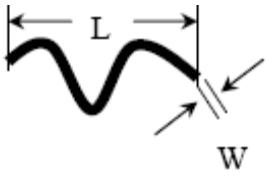

**3.Inspection item and criteria**

**3.1 Visual inspection criterion in immobility**

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<br>note2: disregard if out of AA<br>  |
| | | W≦0.03mm | disregard | |
| | | 0.03mm<W≦0.05㎜; L≦3.0㎜ | 2 | |
| | | 0.05mm<W≦0.1㎜; L≦3.0㎜ | 1 | |
| | | W>0.1mm;L>3.0mm | 0 | |
| 2 | Polarizer bubble、concave and convex (minor defect) | φ≦0.2mm | disregard | note1: φ=(L+W)/2, L:Length, W :Width<br>note2:disregard if out of AA |
| | | 0.2mm<φ≦0.3㎜ | 2 | |
| | | 0.3mm<φ≦0.5㎜ | 1 | |
| | | 0.5mm<φ | 0 | |
| 3 | Black dots、dirty dots、impurities、eye winker (minor defect) | φ≦0.15mm | disregard | note2:disregard if out of AA<br>  |
| | | 0.15mm<φ≦0.25㎜ | 2 | |
| | | 0.25mm<φ≦0.3㎜ | 1 | |
| | | 0.3mm<φ | 0 | |
| 4 | Polarizer prick (minor defect) | φ≦0.1mm | disregard | note1: φ=(L+W)/2, L=Length, W=Width<br>note2:the distance between two dots>5mm |
| | | 0.1mm<φ≦0.25㎜ | 3 | |
| | | φ>0.25㎜ | 0 | |

## 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 (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  |
| | | Φ ≦0.15mm | disregard | |
| | | 0.15mm< Φ ≦0. 25㎜ | 2 | |
| | | 0.25mm< Φ ≦0. 3㎜ | 1 | |
| | | 0.3mm< Φ | 0 | |
| 12 | Fiber、glass crutch、Polarizer scratch/folded (major defect) | W≦0.03mm | disregard | Note1:L: Length, W: Width Note2: disregard if out of AA  |
| | | 0.03mm<W≦0. 0. 05㎜ L≦3. 0㎜ | 2 | |
| | | 0.05mm<W≦0. 1㎜ L≦3. 0㎜ | 1 | |
| | | W>0.1mm;L>3.0mm | 0 | |

# 13.Precautions for using LCD modules.

## 13.1 Safety

(1)Do mot 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.

## 13.2 Storage Conditions

(4)Store the panel or module in a dark place where the temperature is 23±5℃and the humidity is below 45±20%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.

## 13.3Handling Precautions

(9)Avoid static electricity, which can damage the CMOS LSI.
(10)The polarizing plate of the display is very fragile, please handle if very carefully.
(11)Do not give external shock.
(12)DO mot apply excessive force on the surface.
(13)Bo not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
(14)Do not use ketonics 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.

## 13.4 Warranty

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