



SPECIFICATION FOR TFT LCD MODULE

CUSTOMER : _____

CUSTOMER MODULE : _____

HL MODEL : HG043WV005T01

Preliminary Specification

Final Specification

Customer Confirmation column:

Approved by : _____ Dept. : _____ Data : _____

Please return one of the copies of the specification with your signature to us within two weeks after you receive this document. If it is not returned, we will assume that you agree to the entire contents of this specification document.

| Designed by | Checked by | Approved by |
|-------------|------------|-------------|
| | | |



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1. GENERAL INFORMATION

1.1 features

- 1) Structure: TFT PANNEL+IC+FPC+BL+CTP
- 2) IPS Type LCD 800 dot-segment and 480 dot-common outputs
- 3) 252K Color can be selected by software
- 4) White LED back light
- 5) RGB-24 interface
- 6) Operation Temperature : -20~70℃
- 7) Storage Temperature : -30~80℃
- 8) CTP cover lens : Asahi
- 9) CTP structure : G+G
- 10) LED life time: -/

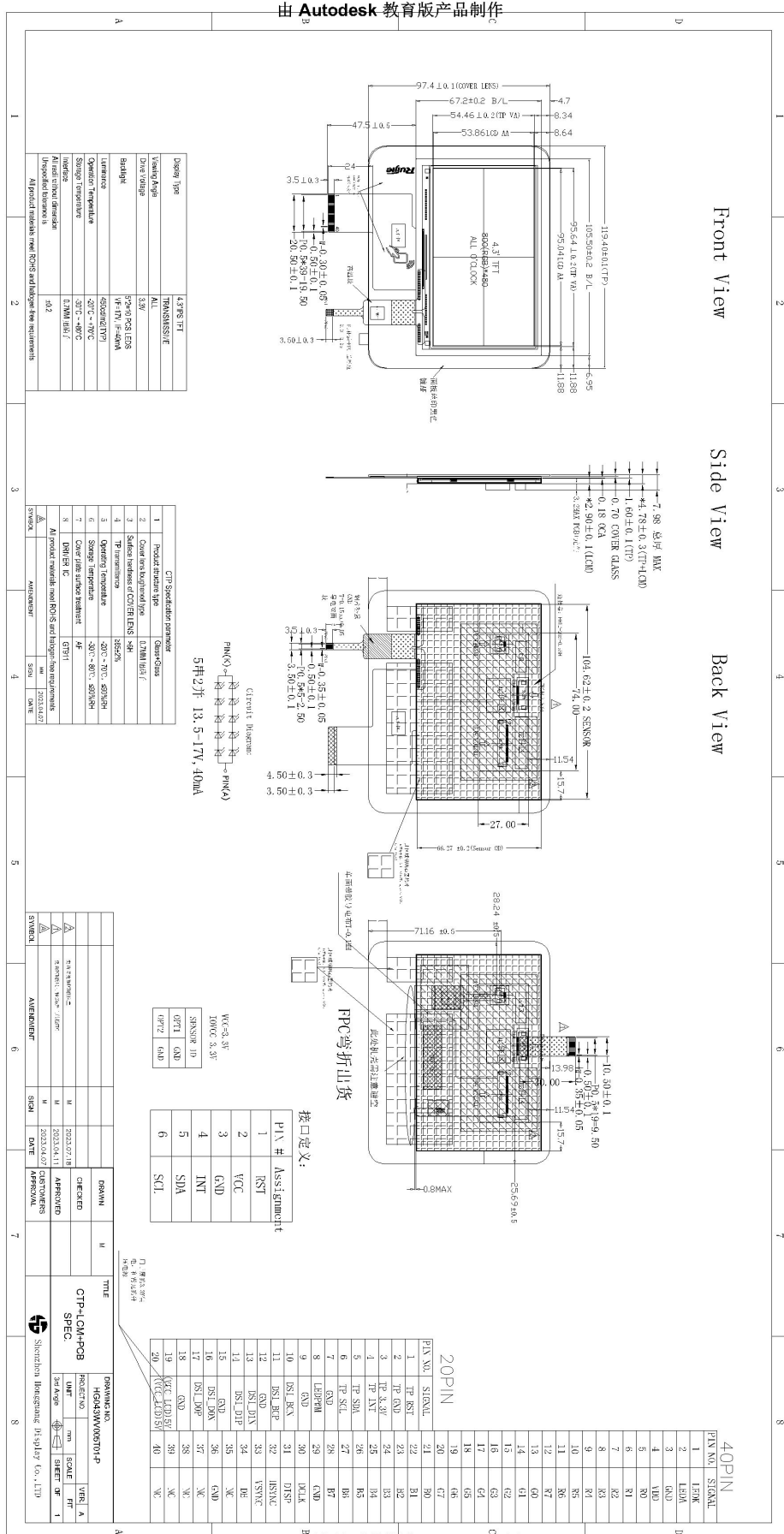
1.2 General specification

| Item of | Contents | Unit |
|-------------------------------|-------------------|----------|
| Panel Size | 4.3 | inch |
| LCD Type | a-si/TRANSMISSIVE | / |
| Display mode | Normally Black | / |
| Pixel arrangement | 800*3 (RGB)*480 | Dots |
| Active Area | 95.04 x 53.86 | Mm |
| Module area (W*H*T) | 105.5*67.2*2.9 | Mm |
| Recommended Viewing Direction | ALL | 0' clock |
| LCM-IC | TBD | / |
| TP-IC | GT911 | |
| Interface | RGB-24 | / |
| Luminance for LCM | 450 | cd/m2 |
| Weight | TBD | g |



2. DIAGRAM FOR LCM

由 Autodesk 教育版产品制作



由 Autodesk 教育版产品制作



3. I/O CONNECTION & BLOCK DIAGRAM

3.1 I/O connection

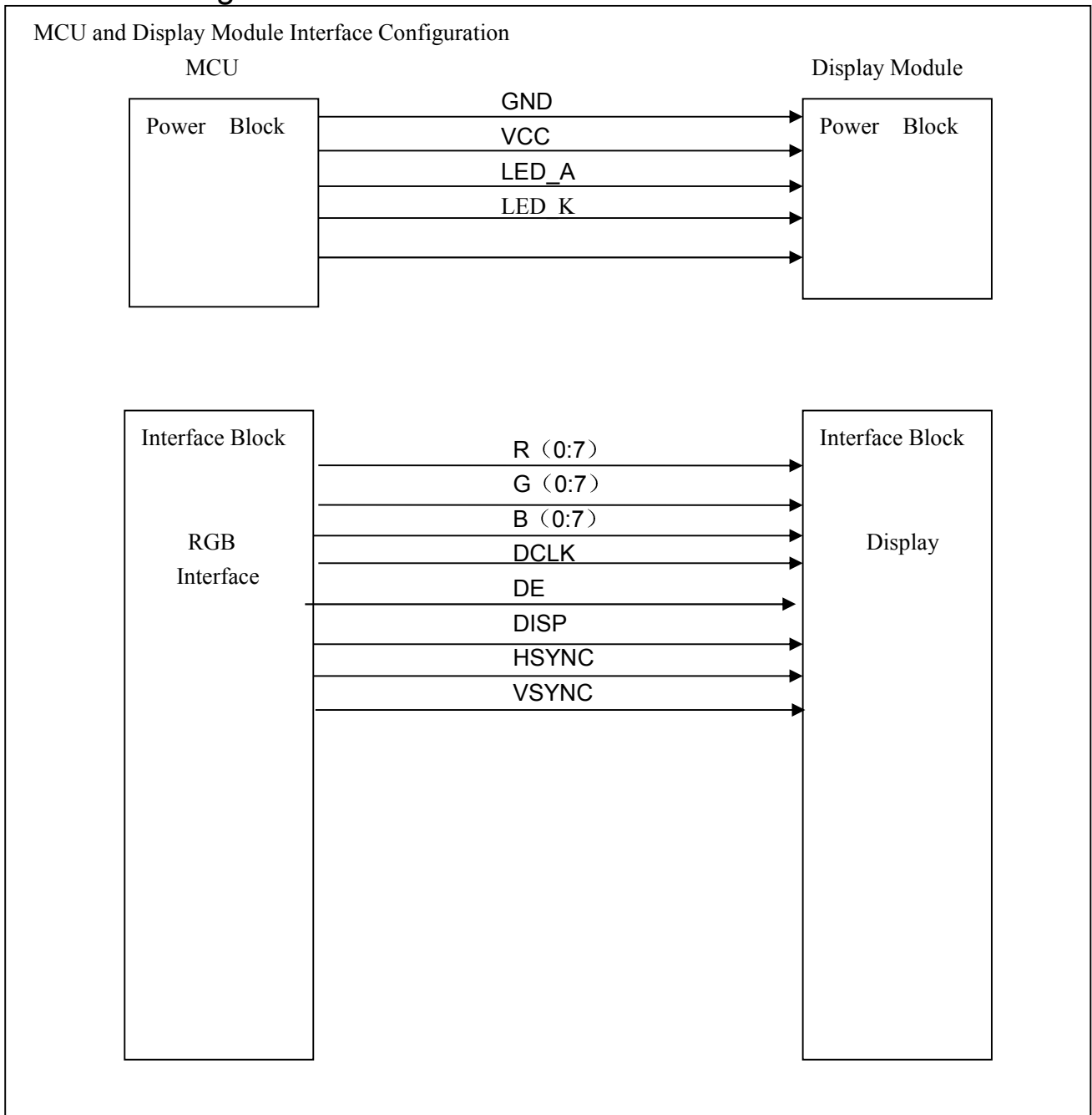
| LCM Pin NO. | Symbol | I/O | Description |
|-------------|--------------|-----|--|
| 1 | LED_K | P | Power supply for LED- |
| 2 | LED_A | P | Power supply for LED+ |
| 3 | GND | P | Power Ground |
| 4 | VCC | P | Power supply to the internal logic power regulator |
| 5-12 | R0-R7 | I | RED data |
| 13-20 | G0-G7 | I | GREEN data |
| 21-28 | B0-B7 | I | BLUE data |
| 29 | GND | P | Power Ground |
| 30 | DCLK | I | Parallel RGB clock input |
| 31 | DISP | I | Display control / standby mode selection |
| 32 | HSYNC | I | Horizontal sync signal; negative polarity. |
| 33 | VSYNC | I | Vertical sync signal; negative polarity. |
| 34 | DE | I | DATA INPUT Enable |
| 35 | NC | - | No connect |
| 36 | GND | P | Power Ground |
| 37-40 | NC | - | No connect |

I: Input; O: Output; P: Power

| TP Pin NO. | Symbol | Description |
|------------|--------------|--------------|
| 1 | RESET | 复位脚 |
| 2 | VDD | 电源正极, 2.8V |
| 3 | GND | Power Ground |
| 4 | INT | 中断信号 |
| 5 | SCL | IIC 时钟信号 |
| 6 | SDA | IIC 数据信号 |



3.2 block diagram





4. ELECTRICAL CHARACTERISTICS

4.1 Absolute Maximum Ratings

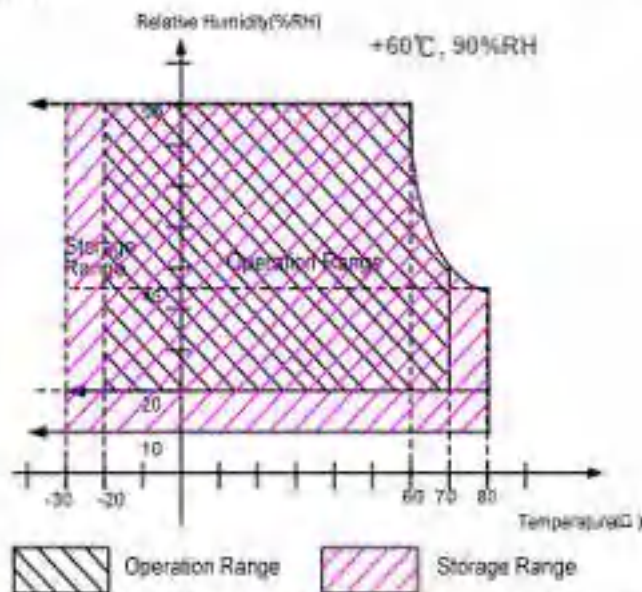
| Item | Symbol | Values | | Unit | Remark |
|-----------------------|-------------|--------|------|------|--------------------|
| | | Min. | Max. | | |
| Power voltage | V_{DD} | -0.5 | 5.0 | V | |
| Input signal voltage | Logic input | -0.5 | 5.0 | V | |
| Operation temperature | T_{OP} | -20 | 70 | °C | Note 3, 4 |
| Storage temperature | T_{ST} | -30 | 80 | °C | Note 3, 4 |
| LED Reverse Voltage | V_R | - | 1.2 | V | Each LED Note 2 |
| LED Forward Current | I_F | - | 25 | mA | Each LED |

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. A module should be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme condition, the module may be permanently destroyed.

Note 2: V_R Conditions: Zener Diode 20mA

Note 3: 90% RH Max. (Max wet temp. is 60°C)

Maximum wet-bulb temperature is at 60°C or less. And No condensation (no drops of dew)



Note 4: In case of temperature below 0°C, the response time of liquid crystal (LC) becomes slower and the color of panel darker than normal one.



4.2 Typical operation conditions

| Item | Symbol | Values | | | Unit | Remark |
|--------------------------|-----------|-------------|------|-------------|------|-----------------|
| | | Min. | Typ. | Max. | | |
| Power voltage | V_{DD} | 3.1 | 3.3 | 3.5 | V | |
| Current for Driver | I_{VDD} | - | TBD | 25 | mA | $V_{DD} = 3.3V$ |
| Input logic high voltage | V_{IH} | $0.8V_{DD}$ | - | V_{DD} | V | Note 1 |
| Input logic low voltage | V_{IL} | GND | - | $0.2V_{DD}$ | V | |

Note1: CLK, DE, R0~ R7, G0~ G7, B0~ B7.

4.3 Backlight Driving Conditions

| Item | Symbol | Values | | | Unit | Remark |
|---------------------------|--------|--------|-----|-----|------|--------|
| | | Min | Typ | Max | | |
| Voltage for LED Backlight | VL | 13.5 | | 17 | V | Note2 |
| Current for LED Backlight | IL | | 40 | | mA | |
| LED life time | - | 30000 | - | - | Hr | Note1 |

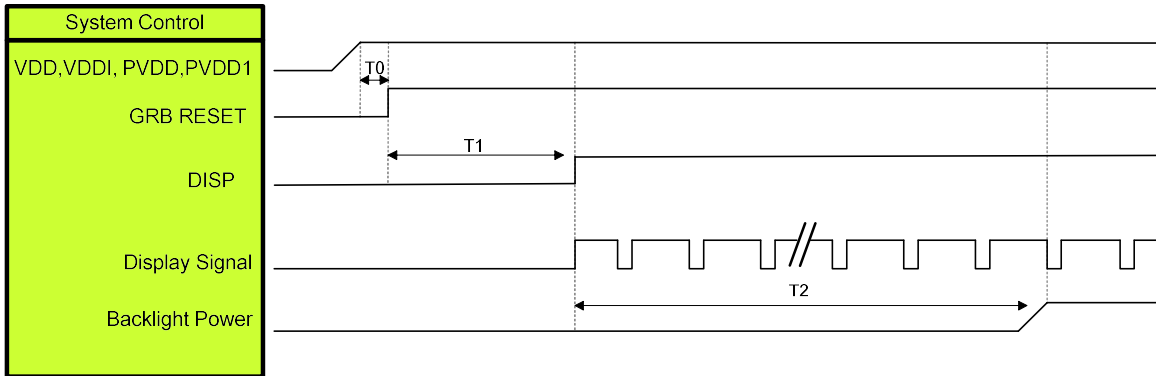
Note 1: The “LED life time” is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25 °C and $I_L=40mA$. The LED lifetime could be decreased if operating I_L is larger than 40 mA.

Note 2: The LED Supply Voltage is defined by the number of LED at $T_a=25\text{ °C}$ and $I_L=40mA$.



4.4 Power Sequence

4.4.1 Power On Sequence

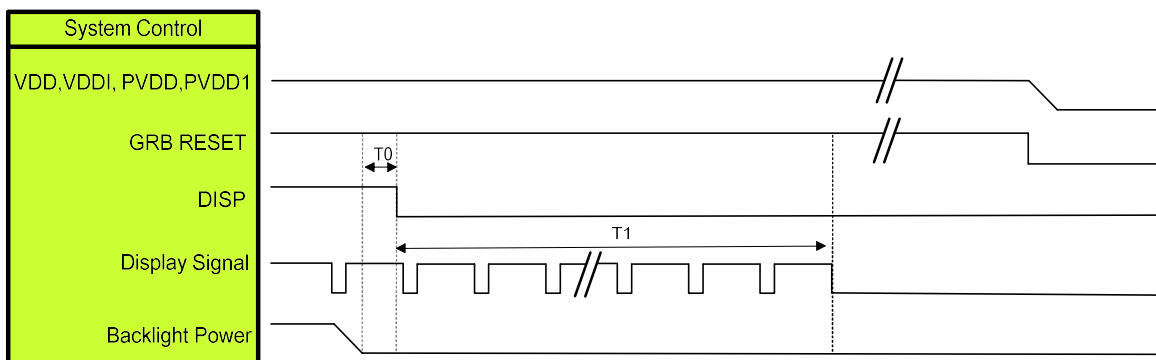


| Symbol | Description | Min. Time | Unit |
|--------|---|-----------|------|
| T0 | System power stability to GRB RESET signal | 0 | ms |
| T1 | GRB RESET= "High" to DISP="High" | 10 | ms |
| T2 | Display Signal output to Backlight Power on | 250 | ms |

Note :

1. When DISP pull "H" or "L", IC will execute the internal power on or power off procedures .Please be careful about the timing of DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.
2. RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]
3. LVDS interface Display signal: DCLK P/N; RX[3:0] P/N

4.4.2 Power Off Sequence



| Symbol | Description | Min. Time | Unit |
|--------|--|-----------|------|
| T0 | Backlight Power off to DISP="Low" | 5 | ms |
| T1 | DISP="Low" to IC internal voltage discharge complete | 100 | ms |

Note :

1. When DISP pull "H" or "L", IC will execute the internal power on or power off procedures. Please be careful about the timing of DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.
2. RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]
3. LVDS interface Display signal: DCLK P/N; RX[3:0] P/N



4.5 Timing Characteristics

4.5.1 Timing Conditions

Parallel 24-bit RGB Input Timing (PVDD=PVDD1=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

| Parallel 24-bit RGB Interface Timing Table | | | | | | |
|--|----------------|--------|------|------|------|--------|
| Item | Symbol | Min. | Typ. | Max. | Unit | Remark |
| DCLK Frequency | Fclk | 23 | 25 | 27 | MHz | |
| HSYNC | Period Time | Th | 808 | 816 | 896 | DCLK |
| | Display Period | Thdisp | 800 | | | DCLK |
| | Back Porch | Thbp | 4 | 8 | 48 | DCLK |
| | Front Porch | Thfp | 4 | 8 | 48 | DCLK |
| | Pulse Width | Thw | 2 | 4 | 8 | DCLK |
| VSYNC | Period Time | Tv | 492 | 496 | 504 | HSYNC |
| | Display Period | Tvdisp | 480 | | | HSYNC |
| | Back Porch | Tvbp | 6 | 8 | 12 | HSYNC |
| | Front Porch | Tvfp | 6 | 8 | 12 | HSYNC |
| | Pulse Width | Tvw | 2 | 4 | 8 | HSYNC |

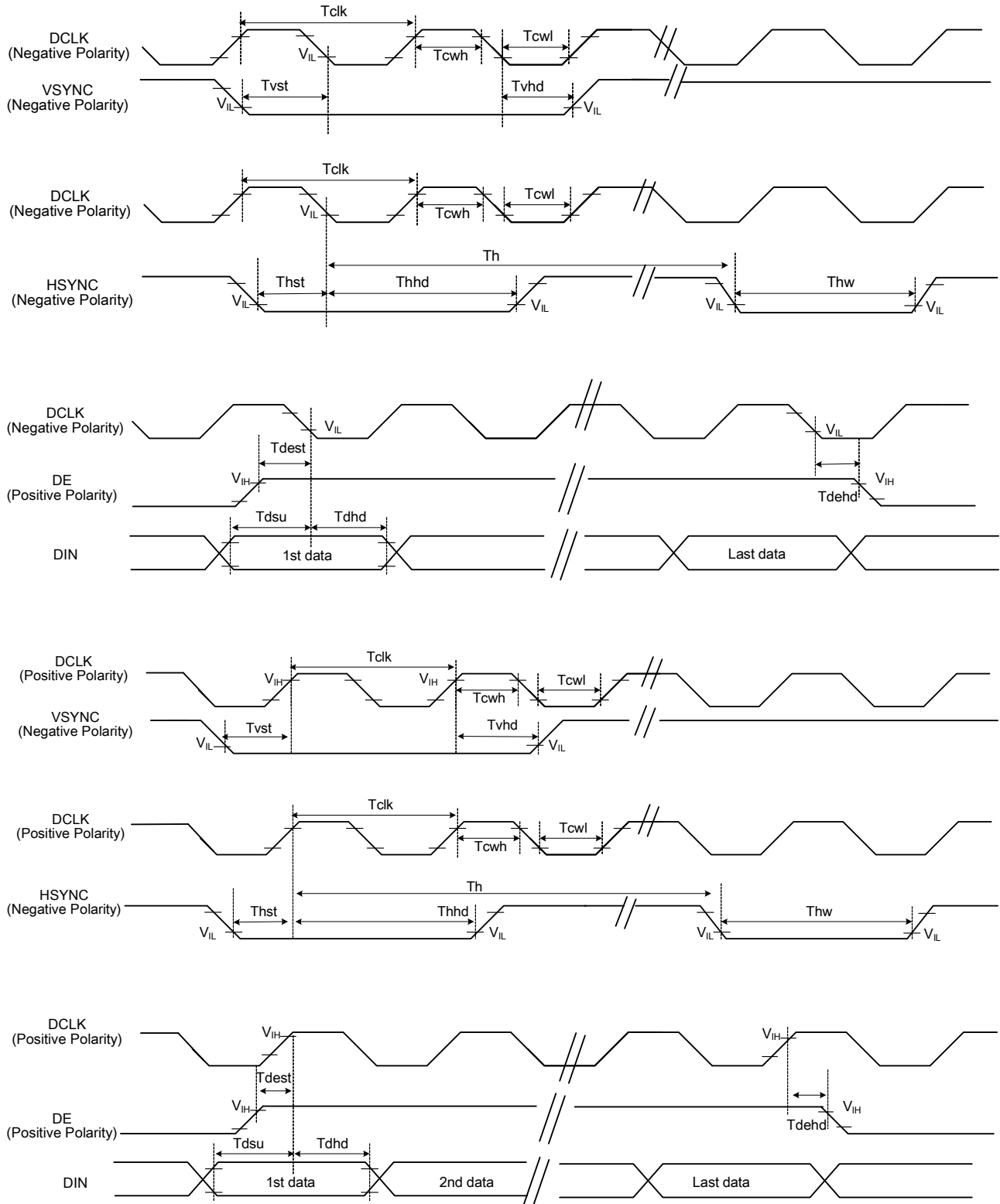
Note: 1. The minimum blanking time depends on the GIP timing of the panel specification

2. To ensure the compatibility of different panels, it is recommended to use the typical setting.

3. It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.



4.5.2 Timing Diagram





5. ELECTRO-OPTICAL CHARACTERISTICS

| Parameter | | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|--------------------------|------------|---------------|---------------------------------|--------------|-------|--------------|------|--------------------|
| Viewing Angle range | Horizontal | Θ_3 | CR > 10 | - | 80 | - | Deg. | Note 1 |
| | | Θ_9 | | - | 80 | - | Deg. | |
| | Vertical | Θ_{12} | | - | 80 | - | Deg. | |
| | | Θ_6 | | - | 80 | - | Deg. | |
| Luminance Contrast ratio | | CR | $\Theta = 0^\circ$ | - | 1200 | - | | Note 2 |
| Color Gamut | NTSC | CIE1931 | $\Theta = 0^\circ$ | - | 50 | - | % | Note 5 @C Light |
| Reproduction of color | White | Wx | $\Theta = 0^\circ$ | Typ -0.03 | 0.311 | Typ +0.03 | | |
| | | Wy | | | 0.338 | | | |
| Response Time | | Tr+Td | Ta= 25° C $\Theta = 0^\circ$ | - | 30 | - | ms | Note 6 |

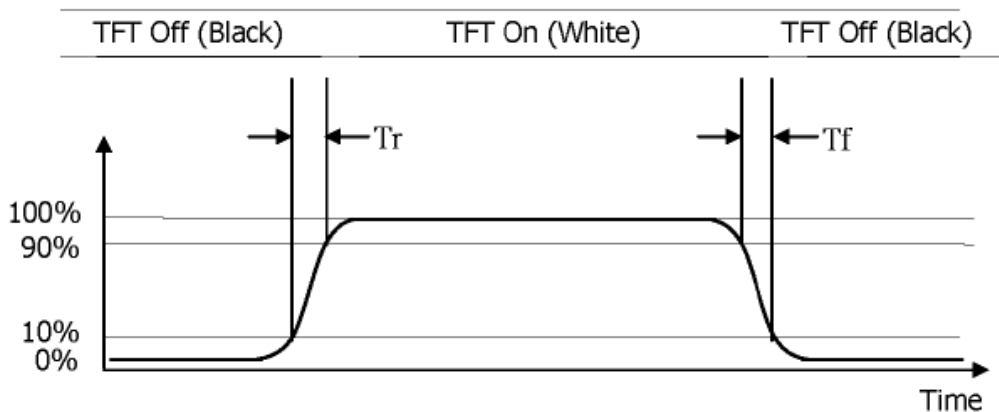


Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface.
2. Contrast measurements shall be made at viewing angle of $\theta = 0^\circ$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIGURE 1 shown in Appendix)
Luminance Contrast Ratio (CR) is defined mathematically.

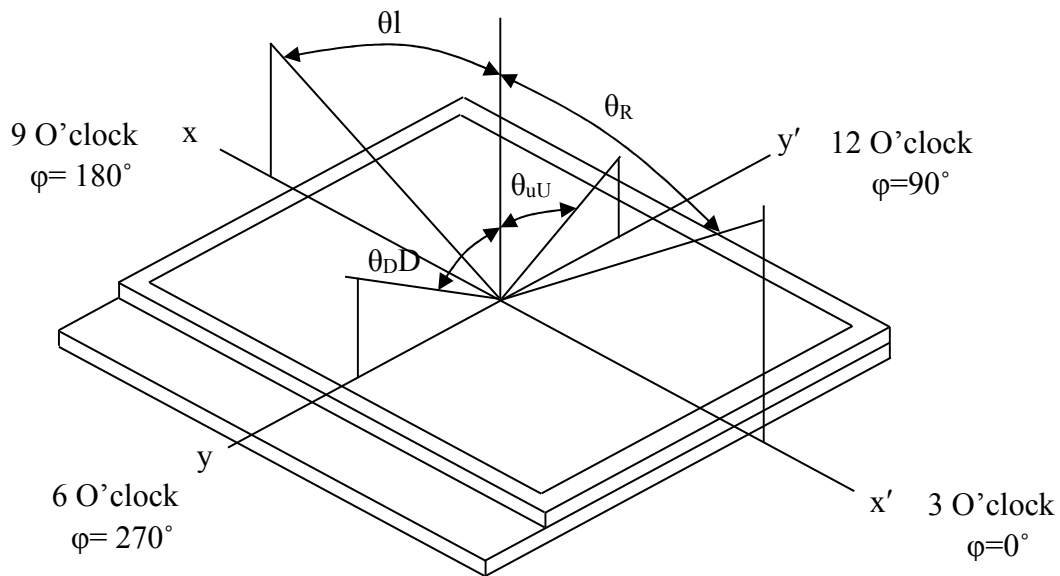
$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Center Luminance of white is defined as the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 4 for a total of the measurements per display.
4. The White luminance uniformity on LCD surface is then expressed as : $\Delta Y = \frac{\text{Minimum Luminance of 9 Points or 5 points}}{\text{Maximum Luminance of 9 Points or 5 points}}$ (See FIGURE 2).
5. The color chromaticity coordinates specified in Table 5. shall be calculated from the spectral data measured with C light. Measurements shall be made at the center of the panel.
6. The electro-optical response time measurements shall be made as FIGURE 5 shown in Appendix by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is T_d , and 90% to 10% is T_r .





Note4. Definition of Viewing Angle: The viewing angle range that the $CR \geq 10$



Note 5: Definition of Color Chromaticity (CIE 1931)

Color coordinate of white & red, green, blue at center point.



6. RELIABILITY TEST CONDITIONS

| No | Test Item | Test Condition | STANDARD |
|----|--|--|---|
| 1 | High Temperature Storage | +80°C / 96Hours | 1. Functional test is OK. Missing Segment, short, unclear segment, on-display, display abnormally and liquid crystal leak are un-allowed. 2. No low temperature bubbles, end seal loose and fall, frame rainbow. |
| 2 | Low Temperature Storage | -30°C / 96Hours | |
| 3 | High Temperature Operating | +70°C / 96Hours | |
| 4 | Low Temperature Operating | -20°C / 96Hours | |
| 5 | Thermal and cold shock | 0°C↔+50°C x 10cycles (30min) (5min) (30min) | |
| 6 | Operate at High Temperature and Humidity | 60°C x 90%RH / 24H | |
| 7 | Vibration Test | Frequency: 10Hz~55Hz~10Hz Amplitude:1.5mm, 2 hours for each direction of X, Y, Z | 1. Function test is OK. 2. No glass crack, chipped glass, end seal loose and fall, epoxy frame crack and so on. 3. No structure loose and fall. |
| 8 | Dropping test | Drop to the ground from 1m height, 1 corner, 3 edges, 6 surfaces. | |
| 9 | ESD test | Contact: ±6KV Air: ±8KV 150PF/330Ω,5Points/panel,5times | The test results shall be subject to the whole machine test. |

NOTE:

1. The reliability items will be fully performed in new sample qualification,
2. The reliability status will be tested as monitor during mass production. Individual reliability test shall be performed by lot, Moreover, the individual reliability item shall be decided according to reliability plan.
3. All samples are inspected after keeping in the room with normal temperature and humidity for 2 hours or above.
4. Vibration test: It is not necessary to test for those products without assembly frame, backlight, PCB and so on.
5. Dropping test: It is necessary for affirming new package.
6. For the high temperature and high humidity test, pure water of over 10 MΩ.cm should be used.
7. Each test item applies for test LCM only once. Then tested LCM cannot be used again in any other test item.
8. The quantity of LCM examination for each test item is 5pcs to 10pcs.



7. INSPECTION STANDARDS

8.1 AQL Sampling inspection standard

使用 GB/T 2828-2003 一般 II 水平, 采用正常检查一次抽样方式; 具体抽检方式参照《成品检验管理程序》、《抽样管理规范》

| 缺陷区分 | AQL 允收水准 |
|------|----------|
| 严重缺陷 | 0 收 1 退 |
| 重缺 | 0.4 |
| 轻缺 | 1.0 |

8.2 Inspect the condition

8.2.1 在 20—40W 日光灯的照明条件下, 样品离检查者眼睛约 30cm 处进行检查。检验方向以垂直线前后左右 45° (以时钟 3 点、6 点、9 点、12 点)

8.2.2 检验者视力需达到标准视力 1.0 以上。

8.2.3 检验者需戴静电手环、两手八个手指套。

8.2.4 外观检验者以目视检查或以菲林对比卡比对。

8.2.5 电性测试使用电测测架, 主板, 电源线及单片机。

8.2.6 若标准与规格书不符时, 以产品发行之规格书特殊检验规格、工程变更为准

8.2.7 辉色度检测请参照样品, 检测方法依照辉色度检验标准。

8.2.8 电测检验环境: 照度为 200LUX 以下, 外观检验环境: 照度为 600LUX-1000LUX, 检验时间: 1 秒-3 秒。

8.2.9 检验工具: 电测测架, 主板, 电源线及单片机, 菲林对比卡, 游标卡尺, 放大镜, 实体显微镜 (必要时) 等等。

8.3 Judgment criterion

小尺寸点、线判定标准: (6.2 寸以内)

| | | | | | | |
|---|--------------------------------------|--|--|--|----|------------|
| 1 | 点状缺陷 (磨伤、异物、针孔、凹痕、缺膜、气泡、白点、彩点、脏点) | | 判定 (A/B/C 区) | $D \leq 0.10$, 忽略不计, 但密集型不允许 | MI | OK |
| | | | | $0.1 < D \leq 0.15$, $ds \geq 10$ | | $N \leq 2$ |
| | | | | $0.15 < D \leq 0.2$, $ds \geq 10$ | | $N \leq 1$ |
| | | | | LCD 亮点: $0.15 < D$ | | $N \leq 1$ |
| | | | | $D > 0.2$ | | NG |
| | | | 判定 (D 区) | 同背面丝印油墨区杂质判定标准 | | |
| | | | 注: 1) D 区的点状缺陷需在不影响 CTP 功能、客户组装及整机的外观的情况下, 判定 OK | | MI | |
| 2 | 线状缺陷 (磨伤、无感划伤、毛屑、纤维等) | | 判定 (A/B/C 区) | $W \leq 0.03mm$, $L \leq 3mm$, $ds \geq 10$ | MI | $N \leq 2$ |
| | | | | $0.03mm < W \leq 0.05mm$, $L \leq 3mm$, $ds \geq 10$ | | $N \leq 1$ |
| | | | | $W > 0.05mm$ 或 $L > 3mm$ | | NG |



中尺寸点、线判定标准：（6.2~8寸以内）

| | | | | | | |
|---|--------------------------------------|--|--|--|----|-------|
| 1 | 点状缺陷 (磨伤、异物、针孔、凹痕、缺膜、气泡、白点、彩点、脏点) | | 判定(A/B/C区) | $D \leq 0.10$, 忽略不计, 但密集型不允许 | MI | OK |
| | | | | $0.15 < D \leq 0.25, ds \geq 10$ $0.25 < D \leq 3, ds \geq 10$ LCD亮点: $0.2 < D$ $D > 0.3$ | | N ≤ 2 |
| | | | 判定(D区) | 同背面丝印油墨区杂质判定标准 | | N ≤ 1 |
| | | | 注: 1) D区的点状缺陷需在不影响CTP功能、客户组装及整机的外观的情况下, 判定OK | | MI | N ≤ 1 |
| | | | | | | NG |
| 2 | 线状缺陷 (磨伤、无感划伤、毛屑、纤维等) | | 判定(A/B/C区) | $W \leq 0.03mm, L \leq 3mm, ds \geq 10$ | MI | N ≤ 2 |
| | | | | $0.03mm < W \leq 0.05mm, L \leq 3mm, ds \geq 10$ | | N ≤ 1 |
| | | | | $W > 0.05mm$ 或 $L > 3mm$ | | NG |

大尺寸点、线判定标准：（8.1~13.3寸以内）

| | | | | | | |
|---|--------------------------------------|--|--|---|----|-------|
| 1 | 点状缺陷 (磨伤、异物、针孔、凹痕、缺膜、气泡、白点、彩点、脏点) | | 判定(A/B/C区) | $D \leq 0.1$, 忽略不计, 但密集型不允许 | MI | OK |
| | | | | $0.15 < D \leq 0.3, ds \geq 10$ $0.3 < D \leq 0.35, ds \geq 10$ LCD亮点: $0.25 < D$ $D > 0.35$ | | N ≤ 2 |
| | | | 判定(D区) | 同背面丝印油墨区杂质判定标准 | | N ≤ 1 |
| | | | 注: 1) D区的点状缺陷需在不影响CTP功能、客户组装及整机的外观的情况下, 判定OK | | MI | N ≤ 1 |
| | | | | | | NG |
| 2 | 线状缺陷 (磨伤、无感划伤、毛屑、纤维等) | | 判定(A/B/C区) | $W \leq 0.05mm, L \leq 5mm, ds \geq 10$ | MI | N ≤ 2 |
| | | | | $0.05mm < W \leq 0.07mm, L \leq 5mm, ds \geq 10$ | | N ≤ 1 |
| | | | | $W > 0.07mm$ 或 $L > 5mm$ | | NG |



8. PACKAGE DRAWING

